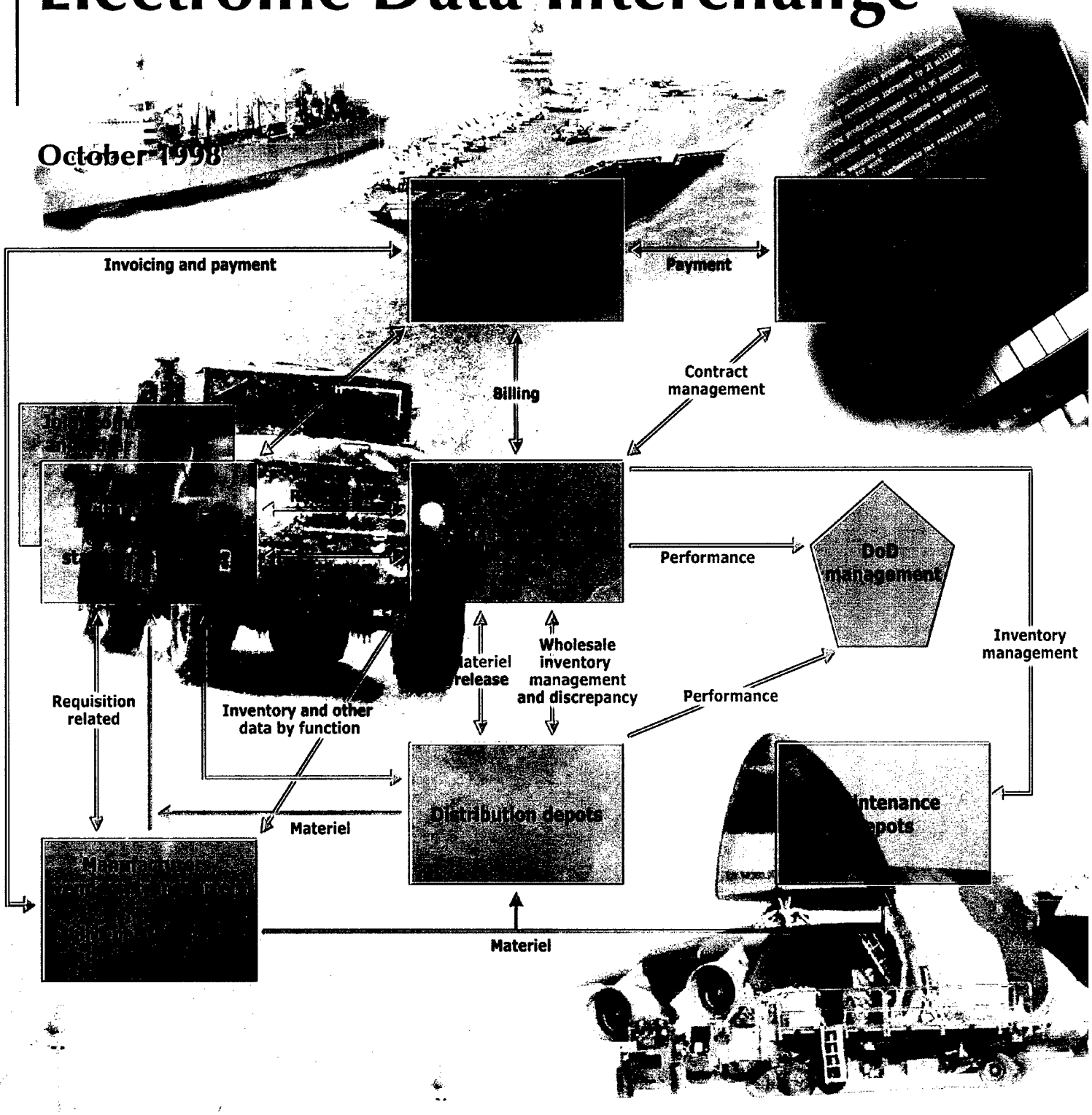
A Business Case and Strategy for

Defense Logistics Electronic Data Interchange

October 1998



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This report analyzes the need to improve DoD logistics data exchanges. For many years, DoD has used the Defense Logistics Standard Systems (DLSS), a series of procedures and electronic transmission formats, to exchange logistics data. When established in 1962, the 80-character fixed-length records moved DoD to the leading edge of automated logistics operations. The military services and defense agencies also developed extensive logistics systems; and DLSS procedures, codes, and formats were embedded directly into the computer codes of these systems.

However, the DLSS are now old and obsolete. The fixed-length formats are saturated and do not permit transmitting additional data. To compensate for these limitations, diverse formats have been developed to meet specific requirements. Further, the pervasiveness of the DLSS inhibits the modernization of legacy systems.

DoD needs to replace the DLSS with another means of exchanging logistics data. The American National Standards Institute's Accredited Standards Committee X12 standards for electronic data interchange (EDI) are excellent tools. Implementing X12 EDI will permit DoD to support expanding data requirements, simplify exchanges with commercial trading partners as DoD expands its logistics outsourcing, and separate data exchange formats from the internal programming of logistics computer systems.

14. SUBJECT TERMS

ADP, automated data processing, ASC, Accredited Standards Committee, DLMS, Defense Logistics Management System, DLSS, Defense Logistics Standard Systems, EDI, electronic data interchange, format, logistics, software, standards, transaction, X12

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Executive Summary

The Defense Logistics Standard Systems (DLSS) are a series of procedures and electronic transmission formats for exchanging logistics data among DoD activities and, to a lesser degree, with civil agencies and commercial organizations. DLSS electronic transactions convey all forms of logistics data, including requisition and issue, inventory accounting, finance, and transportation. The DLSS are critical to all of DoD's supply operations as reflected in nearly one billion annual exchanges.

The Military Standard Requisitioning and Issue Procedures (MILSTRIP) were established in 1962. At that time their 80-character fixed-length records exchanged electronically around the world moved DoD to the leading edge of automated logistics operations. Based on the success of MILSTRIP, several other DLSS were established over the next 15 years. The military services and defense agencies also developed extensive logistics automated data processing systems during that time; and DLSS procedures, codes, and formats were embedded directly into the computer codes of these systems.

Now 35 years later the DLSS remain critical to our logistics operations; they have an annual volume of two billion transactions, but they have become old and obsolete. The fixed-length formats are saturated and do not permit transmitting additional data. To compensate for these limitations, DoD and each service and agency have developed diverse formats to meet specific requirements. Approximately 100 million transactions of unique service and agency formats flow through the Defense Automatic Addressing System (DAAS) annually, and the number of service and agency transactions that bypass DAAS likely exceeds that quantity. This development has created a chaos of formats and systems and increased software costs that the DLSS were designed to avoid. Further, the pervasiveness of the DLSS in legacy systems inhibits the ability of the services and agencies to modernize the systems to incorporate new hardware and software technologies. Lastly, as DoD attempts to integrate commercial organizations into its logistics operations through third-party logistics arrangements, DoD is forcing these outdated, inefficient, and proprietary formats onto its trading partners.

DoD needs to replace the DLSS with another means of exchanging logistics data. The American National Standards Institute's (ANSI's) Accredited Standards Committee (ASC) X12 standards for electronic data interchange (EDI) are excellent tools for replacing the DLSS. The ASC X12 EDI standards

- are national commercial standards widely used in industry and supported by ANSI, the preeminent U.S. standards body,
- use a variable-length format and a flexible syntax that can be tailored to meet DoD requirements, and
- are ideally suited to the extensive use of computer-to-computer data exchanges that occur in DoD logistics operations.

Implementing X12 EDI in place of the DLSS will permit DoD to support expanding data requirements, simplify exchanges with commercial trading partners as DoD expands its logistics outsourcing, and separate data exchange formats from the internal programming of logistics computer systems to permit the systems to evolve more readily with new technologies.

Much of the preparatory documentation for implementing EDI in DoD logistics has already been completed by the Defense Logistics Management Standards Office in developing the Defense Logistics Management System (DLMS). However, because of the extent of DLSS use in the DoD logistics infrastructure, the Office of the Under Secretary of Defense (Logistics) will need to coordinate DLMS planning and implementation effectively with the military services and defense agencies.

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Introduction

BACKGROUND

The Defense Logistics Standard Systems (DLSS) are a series of procedures and electronic transaction formats that govern DoD logistics operations. DLSS transactions convey requisition, inventory, transportation, billing, and other data among the logistics automated data processing (ADP) systems of the military services and defense agencies. Approximately two billion DLSS transactions are exchanged annually, and they are crucial to conduct DoD operations effectively.

However, the DLSS are more than 35 years old and are constraining the growth of logistics data exchanges with the following consequences:

- *Limiting the amount of data that can be transmitted.* Because the DLSS have a fixed-length 80-position record format, they do not support the requirements of new DoD, service, and agency initiatives.
- *Increasing the cost of ADP operations.* The services and agencies design, program, and operate solutions that bypass the DLSS limitations.
- *Inhibiting modernization of service systems.* Because the DLSS transaction formats and codes are embedded in the program code and data structures of many legacy systems, their enhancement or replacement with commercial off-the-shelf (COTS) software is inhibited.
- *Increasing the cost and difficulty of developing industry partnerships in third-party logistics.* The DLSS are a DoD proprietary standard and use an outdated format.

These constraints are inhibiting DoD's operational effectiveness as dramatic changes are occurring in military logistics. The environment has changed from the cold war focus of a major war in Europe with pre-positioned forces and assets to operations involving diverse missions anywhere in the world with little notice. DoD needs to support these missions with fewer assets and a smaller logistics infrastructure. To respond to these changes, DoD is developing new logistics strategies. Recent Office of the Secretary of Defense (OSD) and Joint Chiefs of

Staff (JCS) documents describe the vision of future military operations and the technical and data architectures that will support them.[1]

Crucial to *any* DoD information architecture is the exchange of logistics data among the activities and units of the military services and defense agencies. Rather than continuing to operate a combination of DLSS and diverse component-unique transaction formats, DoD needs a new standard system.[2] To meet these requirements, the DLSS should be replaced with commercial electronic data interchange (EDI) standards. These variable-length standards were developed by the Accredited Standards Committee (ASC) X12 of the American National Standards Institute (ANSI) and are widely used by industry and by the government in exchanges with industry.[3] They provide DoD the flexibility and breadth to achieve the logistics data exchanges required by *Joint Vision 2010.*

PURPOSE

This report is intended to assist DoD logistics managers and technical staff members to review the rationale for implementing commercial EDI into defense logistics data exchanges, participate in implementation planning, and develop a technical approach for defense logistics operations using commercial EDI.

This report examines the current means of exchanging logistics data among the military services and the defense agencies, the need to change those means, and the replacement technology. The report also identifies the key organizations that need to participate in the migration to the new system and provides an overview of a migration strategy. The report concludes with a description of the technical approach for operating in an EDI environment.

ORGANIZATION

The remainder of this report is organized as follows:

- *Chapter 2* describes the current logistics environment, the uses and limitation of the DLSS, and the rationale for replacing them with commercial EDI. Appendix A provides additional information about the development of DLSS and its replacement.

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[1] The documents include *Joint Vision 2010* by the Chairman of the JCS and a series of documents published by the Deputy Under Secretary of Defense (Logistics). Appendix C identifies these documents.

[2] The DoD components include the military departments and defense agencies.

[3] The X12 standards for EDI are also a federal government standard, Federal Information Processing Standard (FIPS) 161-2, May 1996. In this report the term "EDI" is used synonymously for the ASC X12 EDI standards. In its broadest sense EDI can encompass other formats, and the DLSS themselves were an early form of EDI that helped generate the X12 standards.

- *Chapter 3* identifies organizational roles and responsibilities and implementation goals.
- *Chapter 4* identifies the steps to conduct implementation planning and presents a representative approach to phased implementation.
- *Chapter 5* provides cost and benefit estimates.
- *Chapter 6* describes how DoD can implement commercial EDI technology in its functional and technical environment. (Appendix B provides additional information on technical issues.)
- *Chapter 7* summarizes the report.

Chapter 2
Need to Revise Logistics Data Exchanges

CURRENT ENVIRONMENT

Defense Logistics Standard Systems

DoD established the Military Standard Requisitioning and Issue Procedures (MILSTRIP) in July 1962. MILSTRIP defined DoD *procedures* and transaction formats for the inter-service/agency requisitioning of materiel and related transactions that previously were accomplished only by memorandums of understanding between the military services and defense agencies by commodity. The introduction of standard procedures and electronic formats was immensely successful. Based on the success of MILSTRIP, DoD expanded the standard logistics processes during the next 16 years as shown in Table 2-1.

Table 2-1. The 13 Defense Logistics Standard Systems

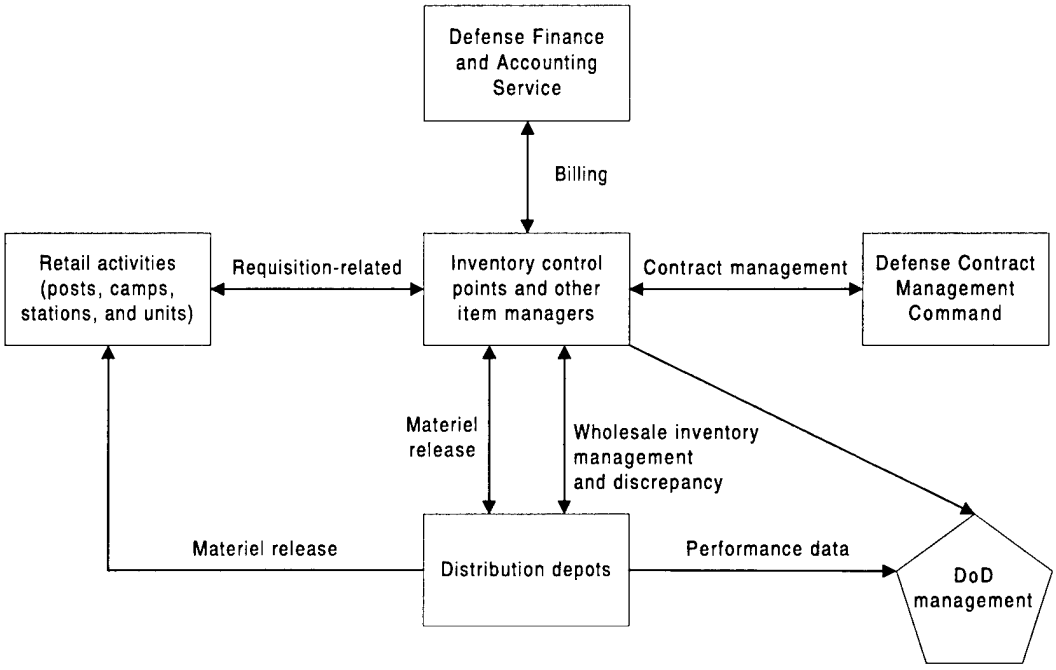
System acronym	Function	Year established
MILSTRIP	Requisition and Issue	1962
MILSTAMP	Transportation and Movement	1963
MILSTRAP	Transaction Reporting and Accounting (wholesale inventory management)	1965
MILSTEP	Supply and Transportation Evaluation (measures fill rate and response time to requisitions)	1968
SDR	Supply Discrepancy Report (formerly called Report of Discrepancy [ROD])	1968
MILSCAP	Contract Administration	1970
MILSBILLS	Billing and Funds Transfer	1973
MILSPETS	Petroleum	1978
Directories and supporting systems		
DoDAAD	DoD Activity Address Directory	1962
DAAS	Defense Automatic Addressing System	1965
MAPAD	Military Assistance Program Address Directory	1967
LOGDESMAP	Logistics Data Element Standardization and Management Program	1975
ILCS	International Logistics Communications System	1984

During this period DoD used the increasing power of computers and telecommunications to convert paper forms into electronic information. Each military service

developed large-scale ADP systems to process its materiel management, depot, and retail supply operations.[1]

Electronic communications also advanced significantly when the Automatic Digital Network (AUTODIN) was installed to support worldwide military communications and the Defense Automatic Addressing System (DAAS) was established to perform the functions of receiving, validating, and routing transactions to an addressee correctly. The combined capabilities of logistics ADP systems, AUTODIN, and DAAS enable DoD to process nearly 5.5 million transactions each day compared to only 35,000 daily transactions possible with paper-based procedures. Figure 2-1 shows the scope of DLSS data flows.

Figure 2-1. Overview of Defense Logistics Standard Systems Environment



The DLSS define primarily inter-service/agency procedures and formats, but the military services also adopted similar formats to manage their internal logistics exchanges. The DLSS formats were further extended for exchanges among DoD, General Services Administration (GSA), and civil agencies through the Federal Standard Requisition and Issue Procedures.

The DLSS moved DoD to the leading edge of technology and logistics management during the 1960s and 1970s and remain indispensable for logistics operations. Nearly one billion DLSS transactions are exchanged annually as well as a similar number of related service and agency transactions.

[1] These systems and their successors as they have evolved are described in DoD documents as "legacy systems." However, their operation and communications are critical to current and future military operations.

System Constraints

The technology embodied in the DLSS and supporting ADP systems remains today about as it was in the 1970s. However, in the intervening years, the capabilities offered by computer and telecommunications technology have expanded enormously, as have DoD's logistics management techniques. That revolutionary growth has spurred increased demands for logistics data that the fixed-length DLSS transactions cannot readily support. Four major constraints are identified in the following subsections.

Inability to Support Additional Data Requirements

The DLSS are composed of fixed-length records that generally use all available record positions. This feature inhibits using the standard DLSS transactions to support new DoD or service/agency initiatives. This constraint reduces the Department's ability to use information to employ a reduced inventory posture more effectively.

To illustrate these limitations, Table 2-2 depicts the DLSS format for the standard DoD requisition. The table highlights several restrictions in the fixed-length formats, but the fundamental problem is that most records are saturated and cannot support additional data.

Table 2-2. DoD Standard Requisition Data

Record positions	Field name	Restrictions and comments
01–03	Document identifier	More than 450 various formats used in the standard transactions; many more used by individual services and agencies
04–06	Routing identifier (to activity)	Three-position code instead of six-position DoD activity address code (DoDAAC) used by key logistics participants to save space; no space for commercial identifiers, such as the data universal numbering system (DUNS), which has more than nine characters
08–22	Materiel identifier	Supports national stock number, commercial and government entity (CAGE), and part number but does not fully support additional identification of nonstandard materiel
23–24	Unit of issue	DoD codes that do not support increasing use of commercial packaging

Table 2-2. DoD Standard Requisition Data (Continued)

Record positions	Field name	Restrictions and comments
25–29	Quantity	Limited to five positions; uses codes for high volume items, such as ammunition
30–43	Requisition number	Concatenation of DoDAAC, Julian date, and serial number
45–50, 54–56	Supplementary address and distribution	Does not support in-the-clear text addresses and supports only a limited number of distribution addresses
52–53	Fund code	No line of accounting data available
62–64	Required delivery date	Last digit of year and Julian date; other DLSS transactions use several different data formats; DLSS generally not year 2000 (Y2K)-compliant
65–66	Advice code	Requisitioner's requirements codes; only one code supported; additional codes created for combinations, but not all combinations supportable
07, 44, 51, 57–61, 67–80	Various codes	Other codes saturate the record

The limitations of the fixed-length format can be illustrated by using a simple example of a shipment of 100 small arms from a DoD depot to a base. The DLSS transaction provides the stock number of the weapon, the quantity, the shipment date, the shipment identification number, and other information. However, the transaction does not have the space to identify the 100 individual serial numbers. These numbers are provided separately by service-unique transactions or paper.

COSTS AND INEFFICIENCIES RESULTING FROM UNIQUE SERVICE AND AGENCY FORMATS

The components' central design agencies (CDAs) have long recognized the DLSS limitations and have had to design, program, and operate unique service and agency programs and transactions to meet evolving logistics requirements. Most old versions are DLSS-like 80-character records and are routed through DAAS. New ones have frequently used diverse variable-length formats that are exchanged directly without any processing by DAAS. DAAS processes more than 400 different service and agency formats; the formats generate approximately 100 million annual transactions. The number of formats and transactions processed independent of DAAS is unknown. Operating these extra and redundant systems increases the costs of DoD's logistics operations. The extent of these additional systems and their attendant costs have never been measured.

CONSTRAINED SYSTEM MODERNIZATION

Many legacy systems were developed contemporaneously with the DLSS, and DLSS formats and codes are intertwined with the legacy systems. This factor has and continues to inhibit modernization of these systems and constrains their ability to respond to new requirements, such as third-party logistics.

DOD PROPRIETARY FORMAT

The DLSS are a DoD proprietary format. Until recently this condition has not been a significant problem. However, as DoD agencies develop their EDI exchanges with industry, the internal formats (DLSS) will be different than their external exchanges. For example, the Defense Finance and Accounting Service (DFAS) receives EDI invoices from vendors and DLSS invoices from DoD customers. These diverse formats increase the cost of supporting DoD systems. As DoD expands its reliance on industry trading partners, more commercial organizations will need to exchange logistics data with DoD activities. DoD should not impose the limitations of the DLSS into these partnerships, but should use commercial EDI standards instead.

Summary

The combined effects of these constraints have produced disjointed logistics capabilities and a resurgence of nonstandard procedures and transactions by the DoD components that the DLSS were created to eliminate. These constraints will become even more limiting when DoD is changing its strategy and methods for conducting operations and consequently affecting logistics data requirements.

CHANGE IN ENVIRONMENT

To meet these changing requirements, the Office of the Deputy Under Secretary of Defense (Logistics) (DUSD[L]) in its corporate strategy cites the following:

> The emerging logistics support requirement necessitates a significant change in the structure and delivery of material and services:
>
> - Current operational plans require support to a joint fighting force. The current threat requires a tailored and rapid response to diverse operational requirements. The logistics infrastructure must be changed to enable a significant reduction in decision cycle and logistics response time....

- The expanded use of commercial products and the adoption of commercial processes to DoD business offers opportunities for enhanced partnerships with the private sector to reduce the costs of logistics support. Electronic data interchange must extend to commercial suppliers and the DoD infrastructure must be compatible with those supporting industry.

- The cost of transportation and information technology has decreased relative to the cost of people and material. Levels of inventory and maintenance can be eliminated through the use of more timely and accurate information and better use of modern transportation capabilities.[2]

Operating in the new environment requires a new approach to the way logistics is conducted.

NEW APPROACH FOR LOGISTICS SYSTEMS

The overarching document for future DoD doctrine is the JCS's *Joint Vision 2010*. This vision emphasizes the requirement for improved logistics support or "focused logistics."

> Focused logistics will be the fusion of information, logistics, and transportation technologies to provide rapid crisis response, to track and shift assets even while en route, and to deliver tailored logistics packages and sustainment directly at the strategic, operational, and tactical level of operations.[3]

Focused logistics will be the precise application of logistics and includes the following components:

- Rapid response and distribution of assets
- Tailored logistics packages
- Total asset visibility (TAV) and in-transit visibility (ITV)
- Reduced inventory and logistics footprints.

Joint Vision 2010 and focused logistics have led to the development of several new concepts, including the Global Combat Support System (GCSS), "an approach that focuses on the development of a common operating environment, common data environment, and shared infrastructure services that enable

[2] Assistant Deputy Under Secretary of Defense for Logistics Business Systems and Technology Development, *Logistics Business Systems—Corporate Strategy*, 15 April 1997, p. 2-1.

[3] Chairman of the Joint Chiefs of Staff, *Joint Vision 2010*, July 1996, p. 24.

interoperability."[4] Publication of *Joint Vision 2010* and the GCSS concepts was followed by a series of reports by the Office of the Assistant Deputy Under Secretary of Defense for Logistics Business Systems and Technology Development, Defense Information Systems Agency (DISA), and other DoD agencies that further define the technical environment that will compose GCSS and support *Joint Vision 2010*. These documents identify the following two requirements:

- DoD needs to use logistics information as an asset.
- Although the *target* logistics information system environment will operate through shared distributed data, in the interim DoD needs to exchange data effectively among existing legacy and new systems.

Figure 2-2, taken from the *Department of Defense Interoperable Information Environment, Concept of Operations*, reflects the new concepts for shared and distributed environment while also depicting the current systems environment.[5] However, Figure 2-2 does not depict the diverse legacy systems linked by a combination of the DLSS and service-unique logistics transactions. Figure 2-2 also does not depict that the DoD logistics universe is expanding to include an increasing number of external participants and systems. The DLSS cannot carry DoD's new data requirements to the next generation applications or future target environment. DoD needs a better alternative.

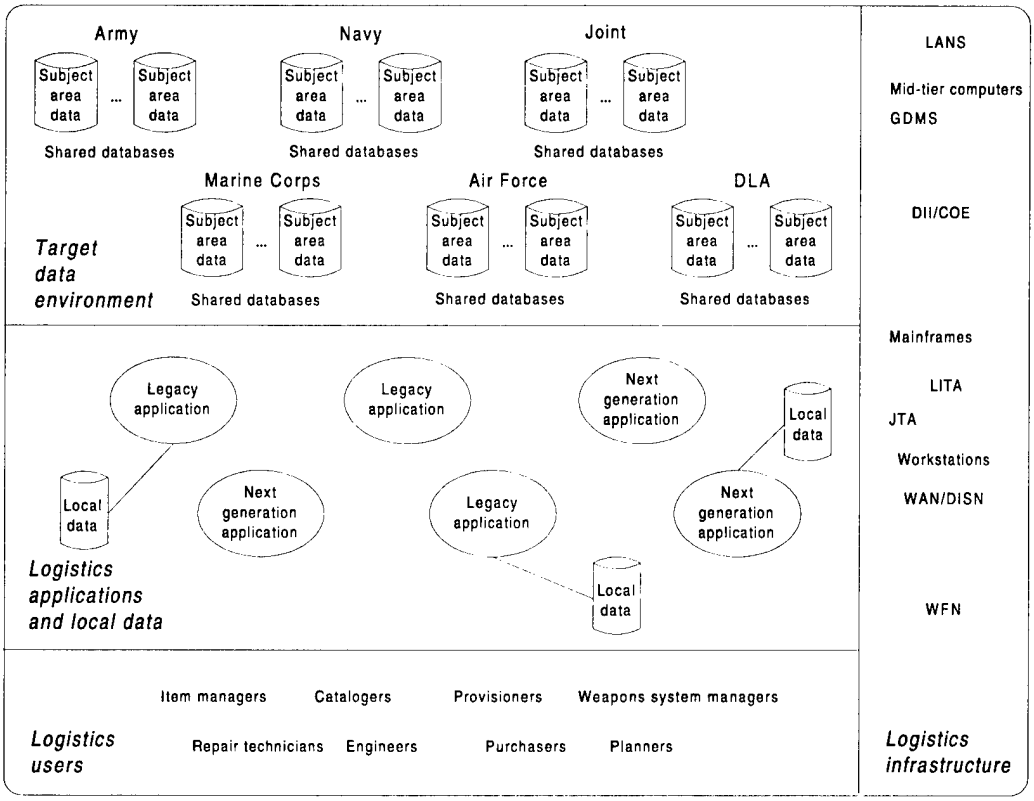
NEED FOR BETTER DATA EXCHANGES

Although the environment and technology are changing dramatically, in many ways, the fundamental components of the logistics ADP environment have not changed in the more than 35 years since the inception of the DLSS. The DoD components still operate separate inventory control point (ICP) systems (the U.S. Coast Guard, GSA, and others also operate quasi-ICP systems). The Defense Logistics Agency (DLA) has a standard distribution depot system and performs a majority of the depot operations, but the military services also operate maintenance and other special warehousing and distribution systems. Numerous retail systems support units and bases. Further, the same basic logistics functions (requisitioning, managing inventory, monitoring materiel movements, and billing) still need to be performed.

[4] Assistant Deputy Under Secretary of Defense for Logistics Business Systems and Technology Development, *Department of Defense Interoperable Information Environment, Concept of Operations*, Glossary, Acronyms, and Abbreviations, 1 August 1997, p. 2.

[5] Assistant Deputy Under Secretary of Defense for Logistics Business Systems and Technology Development, *Department of Defense Interoperable Information Environment, Concept of Operations,* 1 August 1997, p. 16.

Figure 2-2. Interoperable Information Environment



Note: COE = common operating environment; DII = Defense Information Infrastructure; DISN = Defense Information System Network; DLA = Defense Logistics Agency; GDMS = Global Database Management System; JTA = Joint Technical Architecture; LAN = local area network; LITA = Logistics Infrastructure Technical Architecture; WAN = wide area network; WFN = wide frequency network.

At the same time, however, the logistics environment is changing dramatically, as evidenced by the following:

- Additional data elements (including common DoD-wide and unique elements of the DoD components) associated with standard transactions that the 80-character records cannot accommodate
- Additional unique transactions developed by the military services and defense agencies as workarounds to support new data requirements and provide additional functionality, such as maintenance managementDoD and component logistics initiatives (with their success dependent on the exchange of information between systems) that include the following examples:
  - Asset visibility
  - Integrated sustainment

- Lean (agile) logistics
- On-line logistics
- Precision logistics
- Prime vendor
- Regional maintenance
- Velocity management[6]
- Lateral redistribution
- Serial number tracking

- Changing functional relationships, such as DLA's increased responsibility for depot storage at both wholesale and retail levels (including DLA's increased management of a military service's assets and increased exchanges between DLA depots and component ICPs) and increased interservice logistics support in maintenance and other areas

- Increased participation by commercial organizations *within* the following DoD logistics activities:
  - Transportation services
  - Direct vendor delivery (DVD) with data exchanges directly between a DoD user and supplier (such as the deliveries of subsistence, medical supplies, and clothing directly to a user that have been arranged by the Defense Supply Center Philadelphia)
  - Storage of DoD's primary operating stocks and reserves (that are maintained with commercial inventories)
  - Maintenance and repair services
  - Disposal activities
  - Quality and discrepancy efforts.

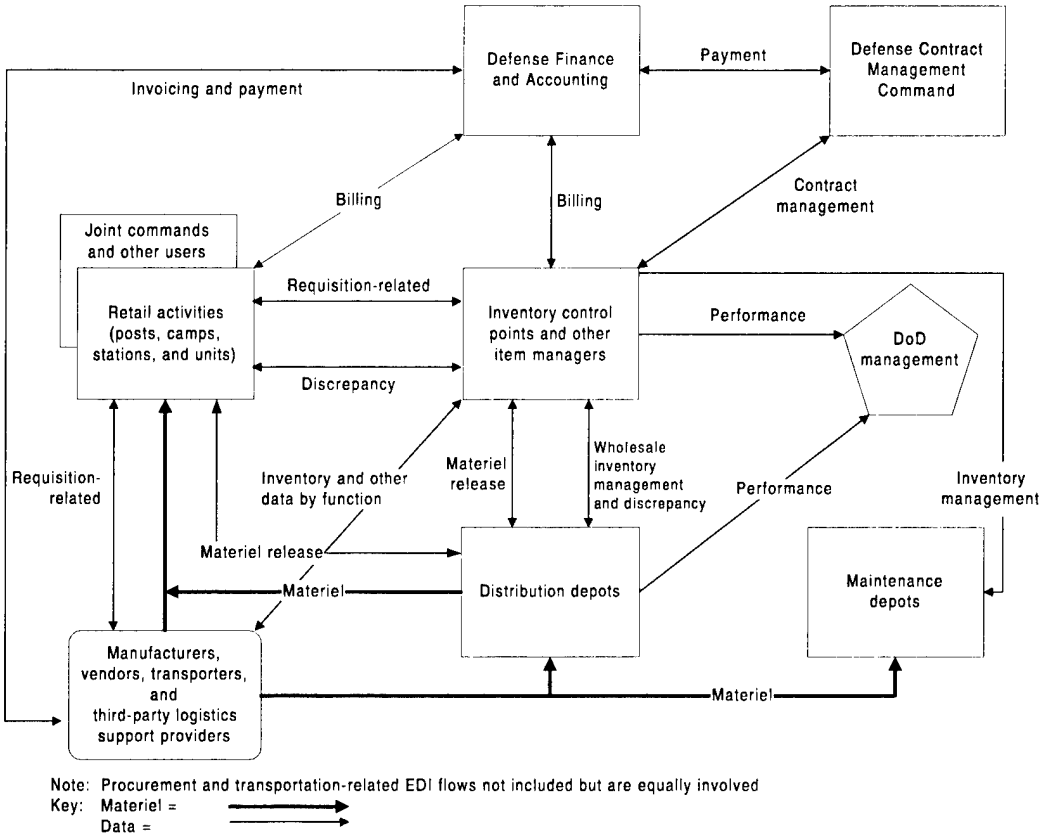
Figure 2-3 reflects the expanded flow of data.

The DLSS with their 80-character limitation do not support most of the expanded data flow. Any effort by DoD to impose the DLSS on industrial trading partners

[6] All items on the list of DoD and component initiatives through velocity management are cited from Assistant Deputy Under Secretary of Defense for Logistics Business Systems and Technology Development, *Logistics Business Systems—Corporate Strategy*, 15 April 1997, p. 4-5.

would not only contradict the federal policy for using EDI, but would increase the cost of operations by requiring contractors to maintain several systems and interface programs. The need for better data exchanges can be accommodated by implementing the Defense Logistics Management System (DLMS).

Figure 2-3. Potential DoD and External EDI Flows



IMPLEMENTING COMMERCIAL EDI THROUGH DEFENSE LOGISTICS MANAGEMENT SYSTEM

The DLMS replaces the fixed-length DoD proprietary DLSS with the variable-length ASC X12 EDI standards within DoD logistics. The ASC X12 EDI standards offer a broad base of business transactions to support DoD. The Defense Logistics Management Standards Office (DLMSO), the proponent of the DLMS, has already completed a great deal of the work to prepare the DLMS for implementation. The functionality of more than 450 DLSS fixed-length transaction formats was consolidated into approximately 25 ASC X12 EDI transaction sets. (See Appendix A, Table A-1, for information on the relationship of DLSS to ASC X12 transaction sets.) However, the DLMS is more than a simple replacement of the DLSS. Working with the military services and defense agencies, DLMSO included more than 100 enhancements for additional data and new

capabilities proposed by the services and agencies in the DLMS procedures and transaction set formats.[7] The DLMS procedures and transaction set formats have been developed and documented. They are *ready to be implemented.* (See Appendix A for more information on the DLMS program history).

RATIONALE FOR IMPLEMENTING EDI IN DOD LOGISTICS

EDI has been proposed as the replacement for the DLSS for several reasons, including the following:

- *Support by ANSI*, a neutral and independent national standards body that represents the full spectrum of U.S. commerce and government. Further, other ANSI standards operations span many ADP and other functions used by the government and industry.
- *Extensive use in industry*. Most of America's largest corporations use EDI in their operations.
- *Increased use in government*, particularly in procurement and related functions in exchanges with industry. DoD's EDI implementation includes the following efforts:
  - Standard Procurement System
  - DLA's prime vendor programs for subsistence, medical supplies, and uniforms
  - DFAS' use of commercial invoices for contractor payments and remittance advice provided with electronic funds transfer[8]
  - Progress payments by Defense Contract Management Command
  - The defense transportation network's extensive use of EDI, including EDI manifests from transportation sites and shipper EDI invoices for transportation services[9]
  - Navy program reporting for ship construction

[7] For a summary of the enhancements, see Logistics Management Institute, *Modernization of the Defense Logistics Standard Systems—Establishing the Functional Baseline*, Volume I, DL902R1, Donald F. Egan, et al., September 1991.

[8] The DLMS version of the Military Standard Billing System (MILSBILLS) includes the internal DoD invoice that uses the same EDI transaction set.

[9] The Transportation Coordinator's Automated Information Management System II for military bases will also use EDI extensively.

- Material safety data sheets used by DLA and the Navy[10]
- Ordering and tracking of hazardous waste disposal by the Defense Reutilization and Marketing Service (DRMS).

The Internet and the World Wide Web represent an alternative approach. However, the bulk of the DLMS-related transactions are high-volume, machine-to-machine, routine business transactions. For these types of transactions, EDI is more effective than the Web.[11] Nearly two billion DLSS transactions are still exchanged annually, and the number of unique logistics transactions by the DoD components may exceed that amount.

As DoD seeks to conduct paperless acquisition, why should DoD exchange purchase orders, shipment notices, and invoices with industry by EDI while the underlying DoD requisitions, dues-in, and receipts use a different format? DLMS implementation will introduce a standard approach used by *all* systems, communications architectures, and technical staff members. This standard approach will also be consistent with exchanges with commercial trading partners. Although substantial savings will result, the very expanse of the effort makes estimating savings difficult. DLMS EDI will replace DoD and service/agency proprietary standards with a proven national standard. The DLMS is the means to use a transaction format that is both an industry and a federal standard for intracomponent exchanges, intercomponent exchanges, exchanges among government and commercial trading partners, and exchanges among commercial organizations themselves.

Will the implementation of EDI save money? Yes. However, the most extensive savings in adopting EDI or electronic commerce (EC) are obtained by converting paper forms and manual processes to automated transactions. The DLSS already accomplished those savings. Converting from one electronic format to another will not redouble the savings. Nonetheless, savings will accrue by reducing ADP programming and support costs caused by the myriad of the DoD components' unique programs, formats, and communications used to bypass DLSS inadequacies.

The DLMS will also promote future modernization efforts by separating the format of data exchanges from the application systems themselves. One great difficulty in modernizing the many DoD logistics systems has been that DLSS data and transaction formats are embedded in program code. The impact of this

[10] This report retains the Navy's preferred spelling of "material" for material safety data sheets and Navy programs but uses the prevalent spelling of "materiel" in other contexts.

[11] Some critics of DoD's adoption of EDI cite that most current corporate implementations use the Web, not EDI. However, most large corporations have already implemented EDI in key intercompany logistics functions and are now implementing the Web for customer sales and support and other machine-to-human functions. Also note that the Internet as a telecommunications path, not the Web, is being used increasingly to exchange X12 EDI data.

difficulty was realized recently when DoD evaluated the cost of converting organizational identifications from DoDAACs and CAGE codes to the DUNS. Establishing a DoD *data exchange* transaction format that can be separated from the application systems will allow these systems to evolve freely to support new functionality and technologies. The separation of data exchange formats from the legacy application systems is one of the DII principles and COE requirements for data independence.

BENEFITS

The effective use of logistics data is critical to the success of focused logistics and similar initiatives. The DLSS cannot deliver the data; commercial EDI standards can. Implementation will provide improvements in the following areas:

- Data to support functional initiatives
- Reliance on commercial standards and industry participation
- Technology goals.

Data to Support Functional Initiatives

DLSS transactions do not support an extensive list of data elements, such as serial numbers, weapon systems identification, DUNS, additional nonstandard identification numbers, multiple advice codes, linkage of requisitions to transportation control numbers (TCNs), and linkage of military TCNs to commercial shipment identifications. These data elements and others are needed for serial number tracking, TAV, and initiatives that create lean and focused logistics. DoD's 35-year-old fixed-length standards are data-saturated and no longer viable. The DLSS also do not support several existing procedures that are still paper-based or operated by component systems, including maintenance, discrepancy reporting, and small arms tracking. The DLMS EDI variable-length formats meet DoD's current data requirements and have the flexibility to meet future requirements as well.

Reliance on Commercial Standards and Industry Participation

Several DoD documents indicate the future will require greater participation by commercial partners. The following quotation from an OSD strategy document is an example:

> The logistics information systems will act collectively as a global system, reaching from the battlefield to a sustaining base that includes industry. The expanded use of commercial products affords DoD an opportunity to acquire parts and services from the open market, obtain support directly from a manufacturer, as well as third-party support arrangements. The adaptation of commercial practices, including the use of commercial data standards, enables electronic transactions with industry and vendors. For example, the adoption of EDI standards (ANSI X12) greatly enhances DoD's ability to integrate with industry and can contribute to a reduction in logistics response time and life-cycle cost.[12]

ICPs and contracting offices should not use EC and EDI to solicit and order while the supporting requisition and the materiel due-in information are in a DoD proprietary format. DFAS should not receive invoices from and provide remittance advice to vendors in EDI while DoD receipts and intra-DoD invoices are in DoD proprietary formats. Transportation programs are operating with both DoD manifest formats and commercial manifests. DoD is paying a high cost to operate in EC and EDI externally and the DLSS internally. This cost is further increased by the various unique component formats.

Industry has been using the ASC X12 standards for 20 years in exchanging purchase orders, shipment notices, invoices, and many other transactions electronically. Over the last decade the federal government has also been adopting these standards, particularly in exchanges with industry. This commitment has been demonstrated in presidential memoranda regarding EDI and EC in October 1994 and July 1997, by Congress in the Federal Acquisition Streamlining Legislation Act of 1994, and through federal standards, such as Federal Information Processing Standard (FIPS) 161-2, *Electronic Data Interchange*.

As DoD moves increasingly towards industry support of traditional DoD activities, such as inventory management and weapons systems maintenance, industry needs to participate in DoD data exchanges. EDI will provide a bridge between DoD logistics systems and contractor software that allows them to function together. DLMS EDI replaces DoD proprietary standards with commercial ASC X12 standards. It unifies diverse organizations, procedures, policies, ADP systems, and technologies. It integrates DoD's internal logistics exchanges into the same standards that industry uses.

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[12] Assistant Deputy Under Secretary of Defense for Logistics Business Systems and Technology Development, *Logistics Business Systems—Corporate Strategy*, 15 April 1997, p. 3-2.

DoD Technology Goals

In the last few years the Joint Chiefs of Staff, DISA, and DUSD(L) have proposed through the GCSS a technical architecture that will unify diverse legacy systems and combine them with newer systems to provide information across the logistics spectrum. The technical architecture and underlying systems will manage and exchange data to use information as a corporate asset to achieve DoD initiatives such as focused logistics and total asset visibility.

Key to this effort is moving standard data between systems and users. The DLMS procedures define the interservice logistics data elements and rules for their exchange. The DLMS EDI transaction sets define the formats for their movement. EDI translation software provides both component legacy systems and participating contractor systems with *data independence* that allows them freedom of hardware and software platforms, supports internal business practices, and provides the ability to modernize systems.

SUMMARY

The disjointed logistics capabilities and resurgence of nonstandard procedures and transactions illustrate the need for better data exchanges. The DLMS meets the requirements for additional data and new capabilities needed by the military services and defense agencies. The next chapter identifies organizational roles and responsibilities to implement the DLMS.

Chapter 3
EDI Implementation—Organizational Roles and Responsibilities

This chapter defines the roles and responsibilities of several organizations that are instrumental in implementing DLMS. They include the Joint Electronic Commerce Project Office (JECPO), DLMSO, DISA, DAAS Center (DAASC), and DLMS users. It also identifies basic principles and objectives to guide implementation planning.

PARTICIPATING ORGANIZATIONS

JECPO

The JECPO is responsible for accelerating the application of electronic business practices and associated information technologies to improve DoD acquisition processes. It includes members of DISA, DLA, and the Life-Cycle Information Integration Office. Because DLMS is a major EC implementation that integrates internal and external DoD data exchanges, DLMSO is one of the DLA components of the JECPO organization.

DLMSO

DLMSO is the primary proponent of the DLMS. It operates under the authority of DoD Directive 4140.1, *Materiel Management Policy*. DLMSO's support of logistics data exchange includes the following functions:

- *Maintain procedures for logistics operations among the DoD components.* Previously, these procedures have been MILSTRIP and related military standard (MILS) procedures. They have been combined for the DLMS into a single manual, DoD 4000.25-M, *Defense Logistics Management System,* which consists of several volumes.[1] The variable-length formats have always been the primary focus in developing the DLMS, but the procedures and the components' commitment to a joint process are equally important.

[1] U.S. Department of Defense, *Defense Logistics Management System*, DoD 4000.25-M, Version 2.0, December 1995.

- *Maintain the DLMS implementation conventions (ICs).*[2] Approximately 55 ICs are ready to be implemented. They will require revision to support evolving DoD logistics requirements. The DoD components provide most requests for IC changes. DLMSO coordinates changes through the process review committees (PRCs) and with federal EDI standards committees. In addition, DLMSO coordinates changes through ASC X12 when the basic standards require changes. The ICs are documented in the DLMS manual and are an integral part of it.[3]

- *Chair PRCs.* DLMSO hosts the PRCs that consist of representatives from each DoD component and participating civil agencies. A PRC is established for each DLMS functional area (such as supply, transportation, and finance). The PRCs are the committees that manage the DLMS functionality.

- *Coordinate with other government organizations.* This action includes representing the DLMS and logistics data requirements of the DoD components to OSD, DISA, DAASC, the Federal EDI Standards Management Coordinating Committee and its Logistics Functional Working Group, and other organizations.

DISA

DISA plays a pivotal role in the federal and DoD EC architecture. As part of its responsibilities, DISA

- leads technical architecture management,
- coordinates standards,
- leads development of technical solutions and alternatives,
- develops enterprise licensing approaches,
- conducts testing,
- coordinates technical cross-functional integration, and
- conducts systems engineering.

[2] X12 EDI transaction sets, such as the 511 requisition, are generic and available for use by anyone. An IC documents the use of the transaction set by a trading partner community (in this case, the DLMS community). An IC defines data elements, their format, and content. The ICs are the keys to DLMS documentation.

[3] In addition to the ICs, DoD 4000.25-M contains information to assist in the conversion from DLSS to DLMS. This chapter discusses ICs because they have a critical role in documenting the transmission format and conversion issues.

For DLMS operations, DISA will provide the majority of the telecommunications infrastructure. DISA will provide connectivity through its electronic commerce processing nodes (ECPNs) to civil agencies and contractors (and their commercial value-added networks [VANs]) as needed.[4]

DAASC

DAASC will continue to be the center for DLMS transaction flow and conduct its traditional logistics information support functions. DAASC will be the initial recipient of most DLMS transactions and will

- provide retrieval, reporting, and archiving services by collecting data into the Logistics Information Processing System (LIPS) and other long-term storage media;
- route and distribute original transaction sets and copies as requested by users and required by DoD policy;
- route transaction sets to special databases, such as the Global Transportation Network;
- edit and validate transaction sets;
- perform specialized capabilities, such as coordinating the Defense Program for Redistribution of Assets;
- support EDI translation capabilities for selected users; and
- chair the DLMS Technical Review Committee (TRC).

During the migration period when some activities have not implemented DLMS, DAASC will also provide a conversion capability between those activities and the ones that have implemented DLMS.

DLMS Users

The basic DLMS functions will differ very little from the DLSS environment. Users need to follow DLMS procedures for interservice functions and application system data.

The user community needs to be very active in DLMS implementation planning and execution. Further, DLMS users need to participate continually in the PRCs and TRC to ensure that their and other systems evolve with changing DoD logistics requirements. This process was once very proactive, but has attenuated

[4] VANs are companies that provide standard EDI interconnection services between firms operating EDI. VANs, DAASC, and DISA ECPNs perform some similar functions.

recently during the effort to build corporate information systems and independent service modernization efforts. This process needs to be restored to its previous level of cooperative participation.

IMPLEMENTATION OBJECTIVE, PRINCIPLES, AND GOALS

Business Objective

The objective is to implement DLMS EDI throughout the DoD, participating civil agencies, and logistics contractors. This implementation will be in support of core logistics functions, new logistics initiatives, and efforts to reduce unique service programming developed to bypass DLSS limitations.

Core Principles

DLMS implementation will be

- guided by recommendations from participants (including functional and technical experts; retail, wholesale, finance, and transportation specialists; and all users, including military services, defense agencies, joint commands, civil agencies, and contractors) at all levels;
- functionally driven and supported by valid business needs;
- process- and time-phased to minimize disruption of customer systems and benefit from the lessons learned during a previous phase;
- forward-looking[5]; and
- compliant and integrated with other federal EDI implementation efforts and technical EDI architectures of DoD and its components.

Goals

The implementation effort will focus on the following goals:

- Establish (or revitalize previous) joint working groups to oversee planning and implementation.

[5] DLMS will discard outdated DLSS processes, transaction types, and codes where possible and incorporate new user requirements and data.

- Develop an implementation plan to accomplish at least the following actions:
  - Process enhanced data in standard transactions.
  - Incorporate data and transactions of the DoD components into standard transaction sets.
  - Support new DoD logistics initiatives.
  - Expand into maintenance and other areas as appropriate.
  - Eliminate DLSS codes and transactions that provide minimal functionality.
- Document a phased approach for implementation and incorporate a milestone schedule.
- Monitor and manage the implementation.

SUMMARY

JECPO, DLMSO, DISA, and DAASC have major roles and responsibilities for implementing the DLMS. However, they are service providers and joint facilitators and coordinators. The logistics users within the JCS, military services, defense agencies, and civil agencies have the primary responsibility for determining DLMS functionality and supporting its capabilities by modifying their legacy systems and service procedures to reflect interservice standards. Those organizations need to develop and execute a strategy to migrate the DLSS to DLMS and EDI as described in the following chapter.

Chapter 4
Migration Strategy

The DLSS data and transaction formats are embedded into the program code and structure of hundreds of DoD logistics computer programs and databases that support supply, transportation, finance, and other operations used by wholesale and retail activities. These transaction formats are in programs that are decades old and have even been propagated into newer or revised systems. Although the effort to change these systems seems daunting, the alternative of status quo is not acceptable. An ever diverging set of systems in the DoD components tied loosely together by 35-year-old standards and massive data conversions is not acceptable. This set hinders and makes implementing new cross-component initiatives, developing new systems, and moving to DoD's target data architecture very costly.

The strategy to migrate from DLSS to EDI needs to contain the following three major components:

- Map the application system input and output routines to the new formats.[1]
- Expand or integrate the functionality of the application systems and related procedures to support new functionalities such as unique item tracking, asset visibility tracking, and interservice and outsourced maintenance.
- Consolidate unique data and transactions into the EDI formats and eliminate redundant processes.

Because the migration effort will be a significant challenge, it needs to be carefully coordinated and implemented in phases. It also needs to be managed jointly because it affects all DoD organizations and systems.

Migration Planning and Organization

The breadth of DLMS implementation requires an organization that represents the DoD components to coordinate and direct implementation. The following DLMS

[1] Mapping will need to be performed in an extensive number of systems, but is fairly routine.

stakeholders need to participate in planning implementation actions and coordinating their execution:

- Military services and defense agencies, including DLA, DFAS, and the National Security Agency
- Joint commands, including the JCS, U.S. Transportation Command, and other unified and specified commands
- Major civil agencies, including
  - GSA,
  - National Imagery and Mapping Agency (NIMA),
  - U.S. Coast Guard,
  - Federal Aviation Administration, and
  - Veterans Administration
- Supporting organizations, including
  - DUSD(L),
  - DISA,
  - JECPO,
  - DLMSO,
  - DAASC, and
  - Defense Logistics Information Service (DLIS) (formerly Defense Logistics Services Center).

Representation from these organizations should include ICPs, depot operations, retail operations, and technical support. Implementation planning needs to include both functional and technical aspects. To develop the initial DLMS transaction sets, OSD and DLMSO requested the formation of DLMS functional and technical working groups. These groups are needed to establish an implementation plan and related documents that include the following key actions:

- Develop a phased implementation approach, including the means to operate in a combined DLSS and DLMS environment for a transition period.
- Develop a milestone schedule.

- Develop a test plan.
- Monitor and manage the actual implementation, including identification and resolution of new issues and problems and distribution of information to key programming groups.
- Identify and incorporate new logistics initiatives and determine the timing and mechanism for implementing enhancements already identified.
- Expand into maintenance and other areas as appropriate.
- Eliminate DLSS codes and transactions that provide minimal functionality.
- Review unique transactions of the DoD components and perform incorporation or conversion actions.

One of the most complex tasks is to determine the phasing of implementation. The following section addresses this task.

PHASED APPROACH

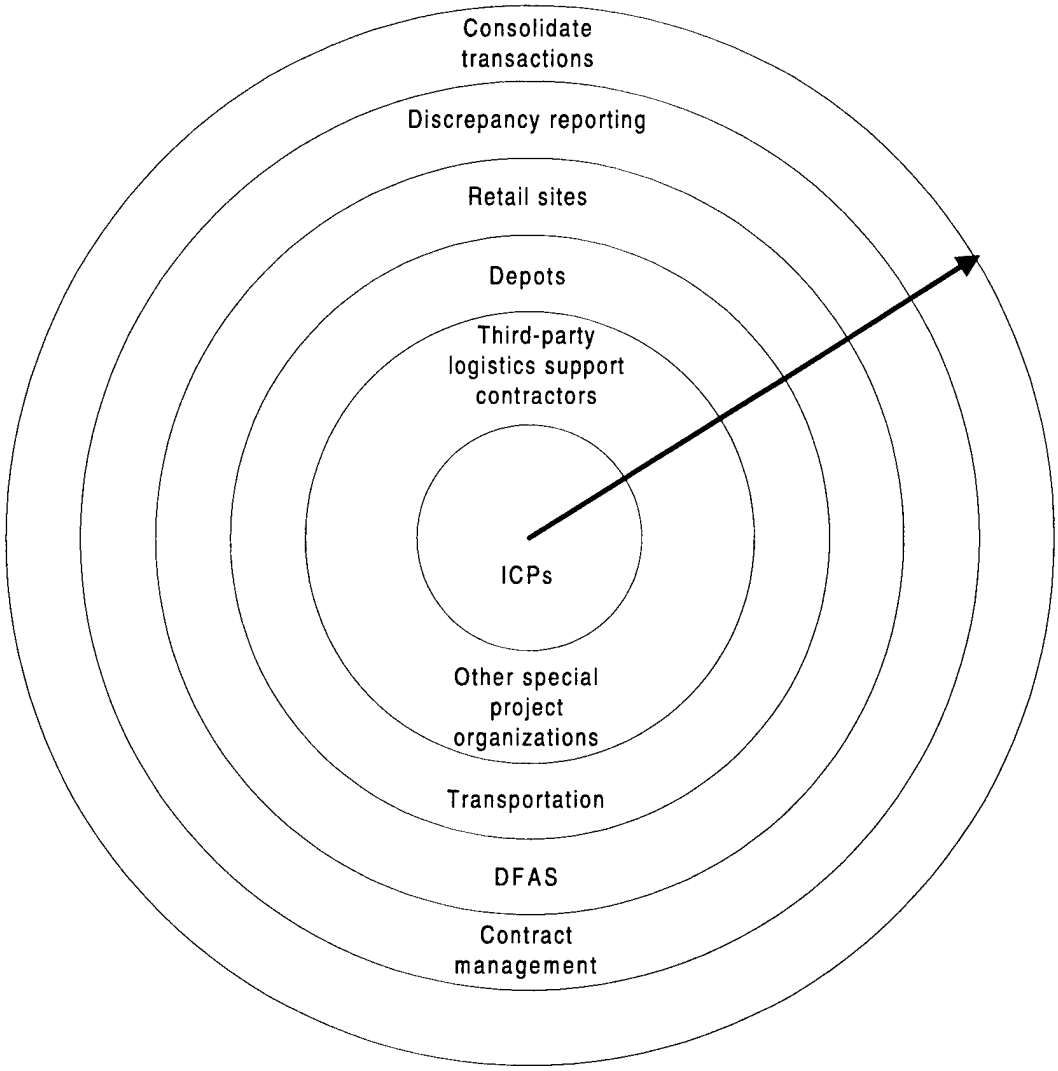
Because the DLMS implementation effort will be a major undertaking, a phased approach is recommended. The planning group will need to determine the order and methods for implementation. One possible approach is to begin implementation with a limited set of trading partners and expand gradually to include exchanges with greater volumes and more systems and activities. This approach minimizes risk, provides an opportunity to apply lessons learned to the next phase, and provides more planning time for the diverse retail systems. The following phases illustrate this approach:

- Third-party logistics operations and special projects, such as those that involve ICPs and contractors
- Inventory management exchanges between ICPs and distribution depots, exchanges between these organizations and the DoD transportation network, and additional exchanges to incorporate maintenance
- Retail logistics and finance systems (including those operated by DFAS)
- Discrepancy reporting
- Consolidation of unique data and transactions of the DoD components.

Figure 4-1 illustrates the inclusion of systems and activities in a phased expansion of the DLMS. Implementing DLMS *first* with third-party logistics support contractors eliminates the need to establish and support software of a DoD

component in the commercial trading partner sites. This step also maintains the federal policy of using EDI as the single face to industry and supports the open systems concept of allowing the commercial trading partners to use their own systems and exchange standard data in standard formats. In concert with this effort, special programs (including a few DoD trading partner communities, such as foreign military sales programs) can also begin DLMS implementation. *Any new program should be developed using DLMS as the basis of transaction exchange.*

Figure 4-1. Phased Expansion of Defense Logistics Management System and EDI



A *second* phase—one that can quickly follow the first phase—extends the ICP exchange capabilities to DLMS exchanges with distribution depots. DLMS exchanges can also be linked to the transportation data network. Lastly, in this step, DLMS exchanges can be linked to maintenance depots, creating a functionality that does not exist in the DLSS.

Implementing the large and diverse mix of retail and finance systems and their exchanges of requisition and retail inventory information as the *third* phase provides extended planning time for the central design agencies (CDAs) to prepare for implementation. This phase also provides an opportunity to apply lessons learned from the previous two phases. The next phase can incorporate the complex, but low-volume, exchanges of discrepancy reporting and contract management. The final phase can be a consolidation of unique service transactions into the DLMS or related EDI transactions. Much of this consolidation will occur in earlier phases. This step should eliminate a considerable body of programming code and effort by CDAs.

A phased approach initiates the effort with a few systems and CDAs and increases the number of participants only as experience is gained. This approach minimizes risk, while still completing implementation in a reasonable amount of time. However, other approaches may also offer advantages and should be considered by the planning organization.

Chapter 5
Cost and Benefits Summary

A classic cost-benefit analysis measures the annual cost of doing business in the current environment, estimates the investment cost to develop the replacement system, and estimates the annual cost of operating in the new environment. However, developing a reliable and comprehensive functional economic analysis for implementing DLMS is not cost-effective because of several factors. The factors include the extensive scope of defense logistics data exchanges; the entangled development of exchange formats with legacy systems; the obscure costs associated with inadequate solutions, redundancies, and inefficiencies in dealing with the DLSS; and the lack of metrics. However, several general measurements allow us to establish a framework for estimating the investment cost and benefits.

IMPLEMENTATION COST ESTIMATE

In the early 1990s the Joint Logistics Systems Center (JLSC) was assigned the task of developing a single standard wholesale materiel management (or ICP) system as well as a single depot maintenance system. In addition, the JLSC coordinated similar endeavors for standard distribution and transportation systems. The JLSC effort also included incorporating the DLMS into the standard systems. Although this task was not completed, JLSC developed a planning document in 1995 that provided a cost and time estimate for implementing DLMS in its scope of operations.[1]

The JLSC estimate for EDI implementation included the standard materiel management system, standard depot maintenance system, distribution standard system, and joint transportation systems. The JLSC study used industry averages for each implemented transaction set and resulted in the estimate of $16.6 million in Table 5-1.

We used the JLSC estimate as a framework for projecting the DLMS implementation cost. We updated the estimate to account for the continued presence of several service legacy systems (rather than the JLSC-intended single standard system); functions (e.g., retail systems and DFAS) not included in the JLSC study; and inflation.

[1] Defense Information Systems Agency, Center for Integration and Interoperability Electronic Data Systems (prepared by Electronic Data Systems, Inc.), *MODELS Implementation Plan*, two volumes, 24 January 1995. See Volume I, p. II-19, and Volume II, Chapter 7, Cost and Schedule, pp. II-48 to II-61.

Table 5-1. JLSC Cost Estimate ($ million)

Description	Estimate
Materiel management system	3.8
Depot maintenance system	2.9
Distribution standard system	2.0
Joint transportation systems	1.1
Infrastructure	4.0
Program-level coordination	2.4
Training and education	0.4
Total	16.6

The first column of Table 5-2 displays the functional areas of the JLSC estimate. The second column provides a revised estimate using 1999 values to account for inflation. The third column provides the baseline estimate for implementing EDI in logistics.

Table 5-2. Implementation Cost Estimate ($ million)

Description (functional area)	Revised JLSC estimate (1999 dollars)	Baseline logistics EDI estimate
Materiel management systems	4.4	–
Component legacy systems	–	25.0
Special systems	–	15.0
Retail systems	–	40.0
Depot maintenance system	3.4	15.0
Distribution standard system	2.4	3.0
Joint transportation systems	1.3	2.0
Infrastructure	4.6	5.0
Program-level coordination	2.8	3.0
Training and education	0.5	2.0
Allocation for exigent changes and costs	–	15.0
Total	19.4	125.0

The following considerations were used to develop the baseline DLMS estimate:

- *Materiel management systems.* In addition to the primary materiel management systems of the DoD components, special and retail systems need to be revised to implement DLMS.
  - *Primary component legacy systems.* JLSC envisioned only one materiel management (or ICP) system. However, we need to plan for the separate systems that support the five military and one DLA ICP systems. Using the adjusted estimate of $5 million for a primary legacy

system, we estimate the implementation cost to be $25 million for all five organizations.

- *Special systems.* These systems were not included in the JLSC study and include systems operated by DFAS, DRMS, DLIS, and 10 small ICPs (including NIMA and Defense Automated Printing Service). Estimating an average cost of approximately $1 million, the implementation cost of these special systems is $15 million ($40 million cumulative).

- *Retail systems.* Retail systems were outside the JLSC scope. Each service and agency operates one and sometimes more than one retail-level (e.g., base, unit, and ship) system. These systems are usually less complex than ICP systems, but are far more numerous. We estimate the implementation cost for the military services and DLA to be approximately $40 million ($80 million cumulative).

- *Depot maintenance systems.* Similar to the JLSC's estimate for ICP systems, JLSC envisioned only one maintenance system. However, the military services are maintaining separate systems. With an estimate of $3.5 million for each military service, we estimate the cost for the four military services to be $15 million ($95 million cumulative).

- *Distribution standard system and joint transportation systems.* The original JLSC estimate was $3.1 million. As these functional areas are still consistent with the JLSC estimate, we adjusted them only for inflation and increases in the scope and functionality of the systems to a combined cost of $5 million ($100 million cumulative).

- *Infrastructure, program-level coordination, and training and education.* These elements include capital improvements, programming, and software for DISA, DAASC, and other DoD components as well as DoD coordination and training. As we are estimating a scope greater than the limited area JLSC envisioned, we estimate $10 million for these areas ($110 million cumulative).

As a result, we estimate a cumulative cost of $110 million for updating DoD's logistics data infrastructure to achieve Joint Vision 2010. EDI implementation will require between 3 to 5 years. Hence, to allow for additional inflation and include a safety net for unforeseen costs, we estimate a total cost of approximately $125 million. This estimate includes system revisions to exchange EDI formats and basic enhancements, such as expanded field sizes, standard dates, and transmission of data that already exist in service and agency systems. The estimate does not address coordinating and implementing major initiatives, such as complete serial number tracking that is generally not present in the large service and agency logistics systems.

BENEFITS

Measurable Benefits

Identifying opportunities for EDI implementation in DoD logistics functions is not difficult; however, as with costs, quantifying the savings of opportunities is difficult. This difficulty is complicated because most EC savings are derived by converting data exchanges from paper to electronic processing. However, the DLMS effort generally involves converting from one electronic means to another, although several exceptions exist and are discussed in the following subsections that identify areas where EDI implementation can reduce operating costs.

EXCEPTION REQUISITIONS

Most requisitions are for standard items in the DoD inventory; specifying the national stock number in the DLSS requisition is the only information needed to identify the materiel. However, sometimes an unusual item or one no longer in the inventory is required. These cases require submitting a DLSS *nonstandard item requisition* followed by paper documentation fully identifying the item characteristics (nomenclature, description, last known distributor, manufacturer, and estimated cost). Item managers at the ICPs need to obtain both components of the requests and enter the paper documentation into an automated information system. This additional action results in added costs and delays (long delays if the paper submission is lost). On the other hand, EDI requisitions transmit all requisition data in one transaction electronically.

A recent survey of more than 1,000 commercial EDI companies identified an average savings of $2.20 per transaction converted from paper to EC.[2] Applying the transaction savings to the 1.6 million exception requisitions processed by the military services annually yields $3.5 million in savings.[3]

DISCREPANCY REPORTING

Discrepancy reports are issued when materiel ordered from a commercial supplier or a DoD depot is received in an incorrect manner. DoD uses the following three major types of discrepancy reports:

- *Supply discrepancy reports* (SDRs, formerly reports of discrepancy [RODs]). These reports are typically reports of shipping errors when an incorrect quantity is received, the wrong item is sent, or similar problems occur. These discrepancies are numerous, but are usually easily resolved.

[2] Daniel M. Ferguson, "The Real Facts of EDI in 1997," *Journal of Electronic Commerce*, Volume 11, Number 1, p. 18.

[3] The Navy estimates that it generates 540,000 exception requisitions a year. We use this amount as an estimate also for the Army and Air Force.

- *Transportation discrepancy reports* (TDRs). These reports are used when a commercial transporter damages or loses materiel, or delivers an item very late. TDRs are often time-consuming to resolve and require additional coordination by both DoD and commercial entities. TDRs are especially complex when they involve legal action against a carrier for damages.

- *Product quality deficiency reports* (PQDRs). These reports are prepared when an item received is defective because a manufacturing, specification, or other quality problem has occurred. PQDRs can be very serious as they can reflect a defective item that has been distributed throughout the DoD inventory and might cause an end-item failure.

Each type of discrepancies is processed using different paper forms.[4] The costs for identifying, investigating, and resolving the discrepancies are high, and significant factors are mail and paper handling costs. In a 1994 report for the JLSC, LMI estimated the savings for using EDI discrepancy reporting to be $40 million over 6 years.[5]

PROGRAMMING SYSTEMS WITH SINGLE EXCHANGE FORMAT

The DLSS represent the standard format for intra-service/agency exchanges, and the military services and defense agencies use a myriad of formats for internal exchanges. In addition, data are exchanged with industry in other formats (EDI or others). Managing the diverse formats increases DoD's ADP training, programming, documentation, and maintenance costs. Additional expenses are incurred in creating new programs, databases, and transactions to overcome DLSS limitations in providing serial numbers, unique service data, and other data that can be carried in standard EDI transactions. Maintaining unnecessary DLSS metadata also increases operating costs. Related actions include maintaining routing identifier codes, media and status codes, multiple date formats, fund code to accounting line relationships, and abbreviated quantities.

These inefficiencies are only a few that exist because of DLSS limitations, but are so diverse and obscure as to preclude a comprehensive analysis in a limited time. To provide an initial estimate, we use the previous example of $2.20 savings per transaction of EDI in replacing paper documentation. We assume that at least 1 percent ($0.022) of the savings can be obtained if DoD logistics programming organizations use a single exchange format, consolidate the number of transactions and codes, and eliminate extra system development efforts caused by DLSS limitations. Extending the $0.022 by the two billion transactions a year that DAASC

[4] Several military services have independently automated a portion of discrepancy reporting actions, and JLSC developed an initial discrepancy reporting system. However, no comprehensive system has ever been employed.

[5] Logistics Management Institute, *Deficiency Reporting System Functional Economic Analysis Mini-Business Case*, AR328LN1, Donald F. Egan and Richard F. Shepherd, April 1994.

processes (these transactions exclude service and agency transactions not routed through DAASC) yields $44 million in savings a year.

This approach is reasonable in light of related cost estimates. In establishing the Distribution Standard System, DLA incurred costs of $10 million to establish links to unique service systems and data. In addition, the Army is estimating costs of $40 million to link its legacy systems and data to the Standard Procurement System.

Linking Commercial Systems to DoD Systems

Such costs are not limited to DoD systems. Implementing standard X12-based logistics transactions will facilitate reengineering the contractor depot repair process to achieve the projected savings and overcome the difficulties experienced in developing and deploying standard systems, such as Commercial Asset Visibility II (CAV II). CAV II is a Navy-developed system to improve the visibility and control of reparable materiel at commercial repair facilities. The Navy uses CAV II at 180 contractor sites. The Marine Corps will begin deployment to its contractors in late 1998. Originally chosen by DoD to be a standard system, CAV II is no longer being implemented by all military services, and they are free to pursue different systems. CAV II and similar standard system solutions have several disadvantages. In addition to the ones previously discussed, the disadvantages include the following:

- Difficulty in developing and deploying a standard system
- Costly and difficult deployment and management of government-furnished hardware and software
- Redundancy of data in a contractor's internal management system and government-provided systems
- Duplicative data entry and manipulation.

Unquantified Benefits

This section discusses benefits derived from reengineering logistics processes that cannot be quantified without determining the scope of the reengineering effort. In this section we cite only two of the many potential examples.

Prime Vendor Programs

DLA has been very successful in establishing prime vendor programs in subsistence, medical supplies, and clothing and textiles. In prime vendor programs, DLA contracts with commercial firms to support all DoD activities in a geographical region for a commodity (e.g., subsistence). A DoD activity orders

directly from a vendor (with the DLA ICP receiving a copy of the electronic transaction), and the vendor delivers items directly to the activity, usually in 36 hours or less. This program provides significant benefits in reducing inventory management, warehousing, and distribution costs. It also dramatically reduces cycle time. For subsistence items, the program also improves morale as brand names used by the prime vendors have better acceptance than unknown or generic brands provided by the depots.

The savings in these programs can be further extended as prime vendor invoices are transmitted to DFAS electronically and even more if concepts, such as evaluated receipts settlement, are used to eliminate invoices. Prime vendor programs can be extended to additional commodities, but the managing ICPs need to select the candidate items and schedules. EDI is a key part of the prime vendor program because DoD orders are sent to commercial suppliers, and suppliers provide DFAS with EDI invoices as EDI exchanges.

CONTRACTOR DEPOT REPAIR

One major area identified for DoD outsourcing opportunities is extending weapons systems maintenance beyond the current 43 percent level performed by organic repair activities. Savings in the area of commercial depot repair of secondary items could potentially exceed $2.2 billion, including a one-time $1 billion reduction in inventory.[6] For contractors to perform as maintenance depots, they need to be full members of DoD supply-chain operations. Several stand-alone systems have been developed by the military services to accommodate this performance. However, in many cases, this action has required extensive programming to include development of government-provided software and hardware. Further, the existing DLSS transaction limitations preclude transmitting all required and desired data electronically. The stand-alone systems use unique transaction records that are not easily imported into or exported from the legacy systems and do not meet all reporting requirements. As a result, full implementation of outsourcing initiatives to achieve these savings is difficult.

Intangible Benefits

Although the intangible benefits are many, the primary ones identified in Chapter 2 include the following:

- Being compliant with FIPS 161-2 and federal EC and EDI initiatives for exchanges with industry, and extending the formats to include intra-service/agency exchanges.

[6] Logistics Management Institute, *Contractor Depot Repair of Secondary Items: An Application for Business Process Reengineering,* Report LG609R1, Larry S. Klapper and Kelvin K. Kiebler, September 1997.

- Establishing data independence between legacy systems and the exchange format. This independence encourages system modernization (either through enhancement of existing systems or replacement by COTS) and evolution as new hardware and software technologies become available. It also enables DoD to implement EDI's eventual replacement more easily than attempting to implement it directly from the DLSS.

- Simplifying electronic exchanges with industry for many initiatives.

SUMMARY

Replacing the DLSS is an infrastructure modernization effort needed for DoD to meet functional data requirements, support reengineering initiatives, and engage in new technologies. It will also reduce ADP costs and facilitate opportunities to obtain greater savings through reengineering initiatives. Although we readily admit that both the cost and benefits estimated in this chapter are approximate, we believe they clearly indicate tangible and intangible benefits to justify DLMS implementation.

Chapter 6
Logistics Data Exchanges in Defense Logistics Management System Environment

This chapter describes the anticipated EDI operating and technical environment and the exchange of DLMS EDI transaction sets in that environment.

FUNCTIONS AND FORMATS

The DLMS will support the following critical logistics functions:

- Requisitioning
- Inventory management
- Billing
- Transportation
- Contract administration
- Discrepancy reporting and tracking.

These functions will continue to be supported by the legacy systems. The DLMS will also support the diverse retail inventory and requisition systems of the DoD components. However, where DLSS formats were intertwined into the program code of these systems and inhibited modernization efforts, the DLMS formats will be independent. This design frees the DLMS (and the systems) to evolve with new DoD logistics initiatives and new technology. In the interim, DLMS will support service and agency legacy systems in their need for redundant coding until those systems are modernized.

LOGISTICS ORGANIZATIONS

The DLMS will continue to support the following logistics organizations that use the DLSS:

- Retail sites of all military services and DoD agencies, including fixed bases; units stationed at these bases, in-transit, or in an operational deployment; Navy ships; and, on an increasing basis, joint commands that oversee the use of materiel and support assets during operations

- Depots—both distribution and maintenance
- ICPs and materiel managers
- Retail and wholesale levels of civil agencies, including
  - GSA,
  - Federal Aviation Administration, and
  - U.S. Coast Guard
- DFAS
- Commercial contractors participating in DoD logistics operations
- Activities supporting specialized functions, such as foreign military sales and disposal.

Several organizations, including DLMSO, DISA, and DAASC, will help operate the DLMS. Their functions are described in this chapter and Chapter 3.

TECHNOLOGY AND BUSINESS INFLUENCES

The DLMS is the implementation of the commercial ASC X12 standards for EDI. The DLMS EDI is compliant and consistent with the following initiatives and standards:

- FIPS 161-2 for using EDI to exchange data among federal agencies and with external trading partners
- Adoption of industry standards
- Use of COTS software
- The following related DoD technical initiatives:
  - GCSS
  - JTA
  - DII and COE
  - Defense Interoperable Information Environment.

The DLMS define a data standard and transaction format that are used *between systems* and are independent of any application system. The DLMS can operate with any legacy system of the DoD components, civil agencies, and contractors. Replacing the DLSS with variable-length transactions that are independent of

applications will promote and assist in the transition to next-generation systems and a shared data environment that will comply with the DII and COE.

Legacy Systems and EDI

The existing legacy systems that generate requisitions, inventory adjustments, and more than 400 other DLSS transactions will continue to operate with the DLMS.[1] A one-time revision consisting of the following three operations will be needed to convert these systems to EDI:

- *Revise input and output routines.* The DLSS input and output routines of all DLSS-related legacy systems will need to be revised from the DLSS to DLMS format. The changes will be numerous, but they will not change the basic functions of the programs except as noted in the following two operations.

- *Support additional functionality.* The DLMS accommodate *enhanced* data, such as unique item-tracking data and additional transportation identification numbers to support TAV. If the supporting application system already contains the data elements, few changes will be needed except to add the data elements to the input and output routines. However, if the application system and process do not contain the data or procedures to support the initiative, more significant changes are required.

- *Eliminate service/agency unique transactions.* Because the DLSS transaction formats are inflexible and have size restrictions, the DoD components have developed a wide variety of transactions to contain intracomponent logistics data. The unique transaction types probably exceed the more than 400 DLSS transaction types, and their number of annual transmissions also probably exceeds the approximately one billion DLSS exchanges. These unique formats vary significantly from 80-column formats (similar to the DLSS format) to extremely long fixed-length and variable-length records. Using DLMS and EDI can eliminate these redundant transactions. The DoD components, in cooperation with DLMSO, need to take one of following three actions for each internal transaction:

  - For unique transactions that are *shadows* of DLSS transactions but contain data that the DLSS cannot carry, incorporate the significant

[1] At the ICPs, the legacy systems include Commodity Command Standard System, Army; Stock Control System (and other modules), Air Force; Unified ICP System, Navy and Marine Corps; and Standard Automated Materiel Management System, DLA. DLA also operates the Distribution Standard System at its distribution depots. In addition, the military services operate many retail systems.

data elements into the associated DLMS transaction set and eliminate the unique transactions.[2]

- For unique transactions of a DoD component that are distinct from the DLSS but have the same functionality as transactions used by at least one other DoD component, incorporate the transactions as new DLMS transactions and eliminate the unique transactions.
- For the remaining transactions (that are truly unique to a service or agency), leave them under the jurisdiction of the service or agency but convert them to an X12 EDI format.

EDI Technology

After the input and output routines of the legacy systems are converted, the systems will operate with EDI without any loss of functionality. When a transaction, such as a requisition, is ready to be sent, the application system gathers, formats, and sends the related data. After the data leaves the legacy application system, the DLSS and EDI environments will be very different. For DLSS processing, the output file is in the format used to transmit it. For EDI processing, the data are transformed as described in the following subsections.

Implementation Conventions

Because the ASC X12 standards are designed to accommodate a wide variety of users, ASC developed the concept of ICs. ICs define how a community (e.g., transportation industry, aircraft industry, DLMS users) uses the standards. DLMS EDI ICs are documents that are the key to military services' and defense agencies' ability to write interface programs and subsequent DLMS transactions. ICs define the following items for programmers of the generating system:

- Data elements to be included, and if they are mandatory or optional
- Format of data elements (e.g., all dates use a *ccyymmdd* format)[3]
- Order of data in the X12 transaction sets
- Activities, by type, that are to receive the transaction set
- Specific rules and formats for the contents of data in the data elements.

[2] The DLMS (unlike the DLSS) has an unlimited capacity to accommodate unique data elements.

[3] With their conversion to ASC X12 version 4.0, the DLMS transactions will be year 2000 (Y2K)-compliant. However, the DLMS capability to carry eight-position dates does not make the application systems Y2K-compliant. The *ccyymmdd* format provides two numbers for the century, year, month, and day.

System programmers use the ICs to write the application interface programs and map the translation software.

INTERFACE AND TRANSLATION SOFTWARE

The output of an application system is a file containing the DLMS data elements and format-related information. The output routines that extract the data from the application system and create the format are called interface programs. The resulting file is often called a *user defined file* (UDF), or *flat file*. In addition to creating the UDF, the interface software edits the output data elements to ensure they are correct and DLMS-compliant and can also make copies of the transaction set when it is to be sent to additional addressees.[4]

As Figure 6-1 depicts, the UDF is provided to a COTS EDI translator program. The EDI translator converts data between X12 and UDF formats.[5] It can also perform a number of other functions, including maintaining telecommunications data, archiving messages, and processing errors. The brand of EDI translation software may determine the structure of the UDF. The output of the translation software is an X12 EDI format ready for transmission to a recipient. The interface software is unique to the ADP system or activity and is written in the standard programming language used by the CDA for the application and database management system. Translation software should always be purchased from a commercial source.[6]

The example in Figure 6-1 describes a typical EDI site environment and the model used most frequently in the commercial world. The interface software operates on the same hardware platform as the application system, and the translation software operates on the same or a smaller hardware platform in the same facility.

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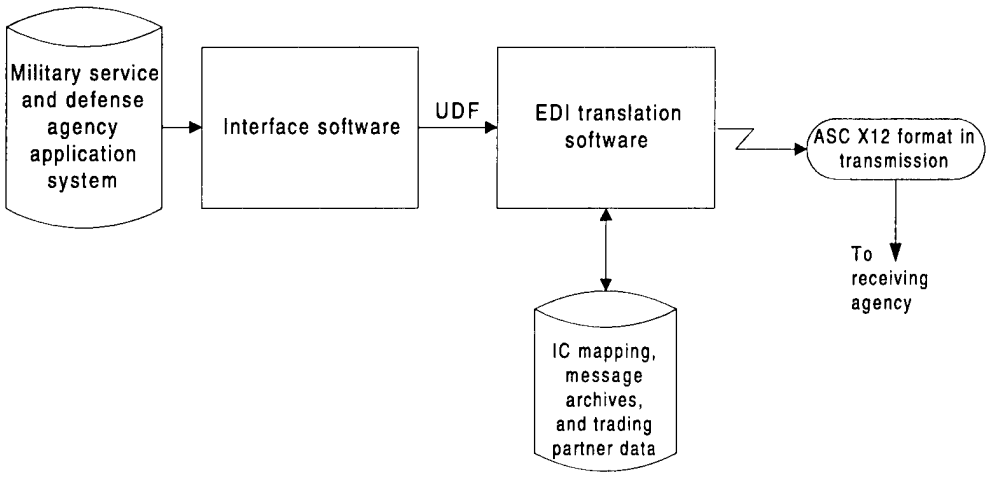
[4] After more than 35 years of DLSS operations, DAAS still rejects approximately 1 percent of incoming transactions for errors.

[5] The cost associated with acquiring COTS translation software and completing the necessary setup and testing is sometime cited as a reason not to implement EDI. However, the translation step allows for a standard interorganization format to be used while permitting the underlying applications (legacy systems) to be *data format independent* and free to evolve. The intertwine of the DLSS formats with the application systems has been a major factor inhibiting previous system modernization efforts. One alternative to translators and translation that is sometimes proposed is to exchange the UDFs or translate only at DAASC. However, if a single UDF format is used, this process is simply a return to the DLSS by another name. Alternatively, a chaotic mix would occur because, for example, the UDF of a direct vendor delivery contractor would not be the same as that of the service's or agency's requisitioner.

[6] Several commercial database management system manufacturers also provide integrated EDI translation software that bypasses the UDF stage and translates the data directly into an X12 format.

Figure 6-1. Processing Data from Application System to Transmission in ASC X12 Format



However, as shown in Figure 6-2, the services and agencies have the following options for locating their translation software and hardware:

- The EDI translation capability can be shared among several locations and functions. For example, the translator that supports the DLMS can also be used by procurement or other functions.
- A single translation hardware and software suite that is appropriately sized can support all EDI operations of a typical large continental United States (CONUS) military installation.
- For low-volume customers, the EDI translation can also be offered on a regional basis. In addition, very low-volume users might benefit by simply transmitting their UDFs directly to DAASC, which provides translation capabilities.

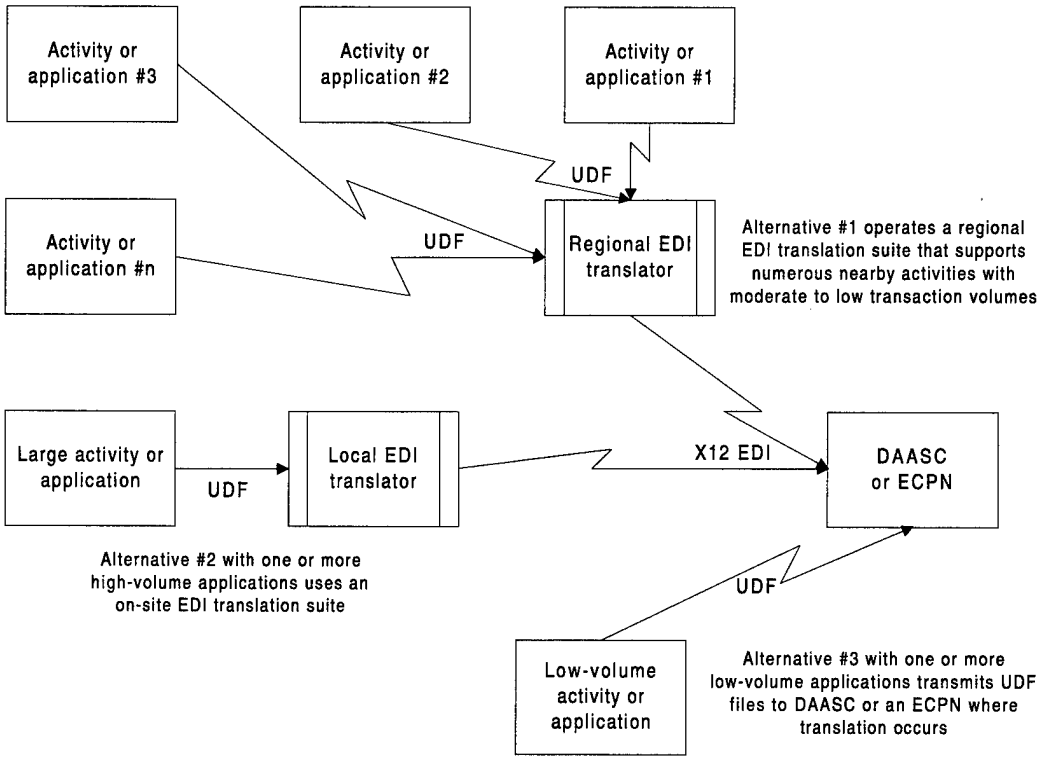
The selection and placement of the most cost-effective translation software and hardware and telecommunications hardware and software will vary by each DoD component and even by each site. A detailed analysis of the existing environment and planned EDI exchanges with industry and DLMS EDI operations will be needed to complete a selection and placement decision. The Navy, with OSD assistance, has acquired EDI translation software and is placing it on all afloat units.

Telecommunications

The DLSS initially used a single dedicated telecommunications path—AUTODIN. AUTODIN was established in the mid-1960s to support DLSS communications. However, it is now based on outdated technology, and DISA officially terminated its support in November 1997. DISA is still maintaining

AUTODIN on an interim basis as some military services and defense agencies convert to other networks.

Figure 6-2. Alternative EDI Translation Scenarios



The DLMS will rely on a broad array of telecommunications networks. DISA's Nonsecure Internet Protocol Router Network (NIPRNET), a combination of DISA-managed communication lines and the Internet, will be the primary path for DLMS communications in CONUS. Units, including Navy ships at sea, outside CONUS will use a variety of communications paths to connect to DISA communications channels. In some cases, these paths will consist of assets managed by a DoD component, and, in other cases, they will be managed by DISA. In limited cases, the paths may even be commercial assets. The paths will include satellite communications, including the Navy's Copernicus system and the Internet.

Civil agency and commercial participants in the DLMS will also require communications capabilities. Civil agency participants will generally connect to a DISA megacenter and from the megacenter to DAASC through NIPRNET. Many commercial participants will be active in other EDI exchanges (e.g., procurement) with government agencies, although some participants will use only the DLMS. The commercial DLMS trading partners may work through their VANs that connect to DISA and from DISA to DAASC via NIPRNET. Alternatively, the trading partners may connect directly to DAASC through commercial lines that DAASC accesses or through the Internet.

Any of these networks can be accessed directly by any telecommunications-capable application system of the DoD components. Computers can be linked to the long-line network through local or wide area networks as opposed to AUTODIN, which requires connections to a limited number of AUTODIN node points. The DLMS communications approach is also very robust. In an emergency, almost any telecommunication link can be used, as opposed to the significant dependence on AUTODIN by the DLSS.

Defense Automatic Addressing System Center Processing

DAASC will continue to serve as a central focus for most, if not all, logistics transactions among the DoD components in the DLMS environment. The operations DAASC performs for a transaction varies greatly by the message type, sender, and intended recipient. Historically, DAASC has performed the following functions:

- Archive all inbound and outbound transactions
- Route messages to correct recipients and locations, especially for units that are deploying or conducting an operation
- Group transactions from different sources[7]
- Open messages and conduct standard or recipient-specific edits[8]
- Place opened messages, especially requisition-related transactions, in LIPS or route them to other DoD databases, such as the Global Transportation Network
- Perform specialized functions, such as coordinating the Defense Program for Redistribution of Assets
- Forward messages outside the DoD telecommunications network to civil agencies and commercial trading partners
- Use LIPS to monitor supply system efficiency.[9]

[7] In special cases, DAASC can hold traffic and convert media types.

[8] Based on customer-approved procedures for data that fail the edits, DAASC can either return the transaction to the sender or modify and forward the data to the recipient.

[9] In the DLSS, the Military Standard Supply and Transportation Evaluation Procedures (MILSTEP) provided measures of supply system performance, especially indicators of fill rates for requisitions and average requisition response times. MILSTEP consisted of structured and voluminously printed monthly reports. The reports were produced by the cumbersome process of depots, ICPs, and other participants sending tapes to DAASC where the reports were compiled. The Logistics Metric Analysis Reporting System replaced MILSTEP and provides on-demand standard and tailored queries and reports.

In addition, DAASC will provide, as requested, translations between UDF formats of the DoD components and the ASC X12 standards and, during the transition period, conversion between DLMS and DLSS formats. After DAASC has performed a specified action on a transaction, it forwards the transaction to the recipient.

Receiver's Processing

The receiver's process is compatible with the sender's process. An activity receiving DLMS transactions from DAASC should generally receive an X12 format into its translation suite. The translation software creates a UDF or other site-specific format. The software validates the incoming file for compliance with the X12 syntax. The translator can accept the data, accept the file with errors, or reject the transaction. If the file is rejected, it is returned to the originator by DAASC. An application interface program processes and enters the data in the receiving application software's database. Depending on the number and type of application systems that the receiving activity operates, the interface program software can be very simple or sophisticated. In addition to converting the UDF file into the application's internal format, the program can also perform the following functions:

- Analyze the incoming transactions and route them appropriately (when the activity operates several application systems)
- Determine recipients for outbound transactions and make multiple copies to send to the translator
- Maintain tickler files for outbound transactions that have not received an expected responding transaction
- Perform edit checks and validations.

The EDI approach is both open and flexible. Although senders and recipients use the DLMS transaction formats and procedures, their EDI architecture may be very different. Senders and receivers may, of course, have a different application system. They may use different interface programs, UDFs, and translation software packages. Senders and receivers may also apply different architectures to the platform, location, and, to some extent, the functions of the interface programs and the translation software.

SUMMARY

DLMS EDI will support all the critical logistics users and functions that the DLSS have supported for 35 years. EDI will also support new functionality. Further, by separating the legacy systems from the transmission format, the DLMS allows these systems greater freedom to evolve with new hardware and software technologies. Appendix B provides more information on the DLMS operational environment.

Chapter 7
Conclusion

The DLSS were established in the 1960s to eliminate the independent efforts of the military services and defense agencies to exchange materiel management data. Those efforts, if continued, would have been more costly and reduced interoperability. For many years the DLSS have effectively served that purpose.

However, because of the limitations of the fixed-length formats, the services and agencies have needed to either bypass or alter the formats. This action is causing increased costs and inconsistent methodologies that the DLSS were intended to prevent. The DLSS formats and transactions do not support today's data requirements. In addition, they do not reflect current and future means for providing logistics support through the increased use of commercial assets and related initiatives.

DoD needs a better means to exchange critical logistics data for the new initiatives, new data, and new technology to support its operational forces as defined by *Joint Vision 2010*. EDI is a proven and effective means of exchanging business data and the procedures for using it to replace the DLSS have already been developed.

Because of the breadth and the depth of the DLSS formats and procedures in the logistics legacy systems, careful and coordinated planning will be needed to manage the implementation effort. The DLSS transmit data across agency, function, and system boundaries. As a result, implementation efforts need the active and closely coordinated participation of all involved parties. Logistics EDI cannot be unilaterally implemented. For these reasons, this report establishes the need for high-level DoD management direction and support to coordinate implementation efforts.

Appendix A
Defense Logistics Management System

This appendix provides additional information on the development of the DLMS initiative presented briefly in Chapter 1.

ORIGINS OF DLSS

In the late 1950s and early 1960s, DoD replaced the practice of each military service independently procuring materiel with the *single item manager* concept. Under this concept, each item in the DoD inventory is assigned to DLA, a military service, GSA, or another agency to manage.[1] Single item management requires considerable communications among the managing activities, commercial sources of materiel, distribution and maintenance depots, and users. To facilitate communications, DoD established MILSTRIP in July 1962. It defined DoD procedures and formats for requisitioning supplies.

Recognizing the success of MILSTRIP, DoD developed several related procedures during the next 15 years in the functional areas listed in Table 2-1 of Chapter 2. Collectively, those procedures are known as the DLSS. (Figure 2-1 in Chapter 2 illustrates the DLSS data flows.)

Making the DLSS successful required more than standardized procedures. After establishing MILSTRIP, DoD used the increasing power of computers and telecommunications to convert paper forms into electronic information. AUTODIN and DAAS were the foundations for that conversion, as follows:

- AUTODIN was installed to support worldwide military communications.
- DAAS was established to perform the functions of receiving, validating, and routing transactions to the correct addressee.

The combination of AUTODIN and DAAS enabled DoD to process nearly 5.5 million transactions each day, compared to only 35,000 daily transactions possible with paper-based procedures. The DLSS have been the central component of logistics data exchanges since 1965.

[1] Responsibilities of a single item manager include procuring, managing, and distributing materiel to users.

New Requirements

The DLSS, in combination with DAAS and AUTODIN, moved DoD to the leading edge of 1960-era technology. However, the technology embodied in the DLSS and many supporting ADP systems of the military services and defense agencies remains about as it was in the 1970s. In the intervening 35 years, the capabilities provided by computer and telecommunications technology have expanded enormously, as have DoD's logistics capabilities. That revolutionary growth has spurred increased demands for logistics data that the fixed-length DLSS cannot readily support.

The ability of the DLSS to meet these requirements has been further reduced as the military services modernized their internal logistics processes (usually to satisfy similar user requirements). These system modernization efforts have proceeded at different rates and along different approaches in each military service. The combined effects have produced disjointed logistics capabilities and the resurgence of nonstandard procedures and transactions by the DoD components—the amount of nonstandard transactions is estimated to exceed that of standard transactions.

DLSS Limitations

Most DLSS problems stem simply from the limitation of the fixed-length format. The following examples illustrate the complexity and limitations that have resulted:

- The standard DoD activity and unit identification is a six-position DoD activity address code. However, to reduce space the DLSS use a three-position routing identifier code to identify ICPs, depots, and other logistics organizations.
- Dates appear in a wide variety of formats; most are four-position (*yddd*) Julian dates.[2] However, three-position Julian dates and other formats are alternatives.
- Numerous other metacodes (including Signal Code and Media and Status Code) have little functional value.
- Quantities are limited to five positions. Special rules deal with quantities greater than those sizes.

[2] The *yddd* format provides one number for the year and three numbers for the day.

- The space for unique data of the DoD components is limited. As a result, the space used for many purposes is not documented.

- Several occurrences of the data cannot be accommodated. For example, the AS1 shipment status of a group of small arms identifies the quantity of weapons shipped, the shipment identification, shipment date, and other information, but cannot transmit a weapon's serial number.

DLMS DEVELOPMENT

The DoD responded to meet user requirements and take advantage of new technologies by initiating the Modernization of the Defense Logistics Standard Systems (MODELS) Program. The DoD memorandum that initiated MODELS states, "It is not merely an update of assorted procedures but a fundamental redesign of the way DLSS functions are performed." To reflect the fundamental change planned for the system, a new name—the Defense Logistics Management System—was assigned.

The Logistics Management Institute was tasked to review the DLSS and the underlying logistics functions and provide recommendations for their modernization. The fundamental recommendation was to replace the fixed-length DoD proprietary transaction format with a variable-length national and commercial standard called EDI. Ironically, the EDI standards recommended to replace the DLSS were inspired by former DoD employees taking lessons from the DLSS and other military techniques to establish EDI in the commercial world. EDI as known today was established in the late 1960s by the Transportation Data Coordinating Committee. The committee was established by a joint group of railroad companies to determine automated means of tracking rail cars. The resulting electronic standards concepts soon spread to other transportation modes and other industries.

The concept was successful, but individual implementation has varied in format. Several companies implemented proprietary standards to obtain a competitive advantage. As a result, many companies requested that the American National Standards Institute establish national standards for EDI. The first release of these standards occurred in 1977, and they are known today as the ASC X12 EDI standards.

During the next 20 years, virtually all large American corporations implemented some form of an EDI program. Typical transactions include purchase orders, shipment notices, manifests, materiel receipts, and invoices. In the early 1990s, several federal agencies began using ASC X12 EDI transactions to support a wide variety of operations. FIPS 161-2, in May 1996, established ASC X12 as the approved means to exchange electronic data between federal agencies and between agencies and their commercial trading partners.

Variable-Length Formats

After accepting the recommendation to use ASC X12 EDI formats, DLMSO tasked the Logistics Management Institute to develop standards that support the DLSS functionality. This task began a 3-year effort to revise and add additional X12 standards to meet DoD requirements. More than 425 DLSS fixed-length formats were consolidated into approximately 25 ASC X12 EDI transactions. More than 100 enhancements for additional data and new capabilities have also been incorporated into the DLMS standards.

The basic business unit of EDI is a transaction set. For example, the business functionality of a DoD requisition is incorporated in the X12 511 requisition. In this case, this functionality is an addition to the preexisting X12 standards. In another case, a DLSS AS1 shipment status has been incorporated into the X12 856 shipment notice, a preexisting X12 transaction set. Table A-1 shows the existing DLSS transaction document identifier codes and their X12 equivalents.

Table A-1. DLSS Transaction Document Identifier Codes and X12 Equivalents

ASC X12 transaction set		DLSS document identifier codes
Number	Name	
140	Product registration	DSA-D, DSF, DSM, DSR
180	Return merchandise authorization and notification	FTA, FTC, FTE, FTG, FTF, FTT
511	Requisition	A0_, A3_, A4_, AM_, P11, P19
517	Materiel obligation validation	AN_, AP_, AX_, AQU, AQV, AV_
527	Materiel due-in and receipt	D4_, D6_, DD_, DF_, DLC-F, DU_, DW_, DX_, DRA-B, DRF, DZK, P30, P31, P32, P39, P3T, P6B (missing receipt)
536	Logistics reassignment	DLS-X
561	Contract abstract	PAA-H, PB1, PBA-H, PE1, PEA-H, PEK, PFK
567	Contract completion status	PK9, PKX, PKZ
568	Contract payment management report	PV1-5, PVA
810	Invoice	FA1-2, FB1-2, FC1-2, FD1-2, FE3-4, FF1-2, FG1-2, FJ1-2, FL1-2, FN1-2, FP1-2, FQ1-2, FR1-2, FS1-2, FU1-2, FV1-2, FW1-2, FX1-2, and corresponding Gs
812	Credit and debit adjustment	FAC, FAE-F, FAR-S, FDC, FDE-F, FDR, FDS, FJC, FJE-F, FJR-S, FTB, FTP, QBI
824	Application advice	DZG, P6S, P_Z
830	Planning schedule with release capability	DMA-E, DY_
842	Nonconformance report	SF361 (TDR), SF364 (ROD), SF368 (PQDR)
846	Inventory inquiry and advice	DJA, DTA-D, DZA, DZE-F, DZH, DZJ, DZL, DZP, DLA-B, DZC-D, DA1-2, DEE-F, P41, P6C, P6D

Table A-1. DLSS Transaction Document Identifier Codes and X12 Equivalents (Continued)

ASC X12 transaction set		DLSS document identifier codes
Number	Name	
856	Ship notice and manifest	AD1-4, ADR, AS_, AU_, FTM, P20, P53, PJJ, PJR, PK5, TK_
858	Shipping information	TB0-9, TC0, TC1, TF0-9, TG0-9, TH0-9, TJ1-5, TJ9, TL0-9, TP0-9, TU0-9, TV0-5, TV9, TX0-5, TX9, T_A-D, T_J-M, "GBL," "ITV receipt"
861	Receiving advice and acceptance certificate	PKN, PKP
867	Product transfer and resale report	D7_, DG_, DHA, P21, P22, P23, P28, P29, P53
869	Order status inquiry	AC1-5, ACM, ACP, AF1-5, AFR, AFT, AFY, AK1-5, AT_1, P6A
870	Order status report	AB_, AD5, AE_, FTD, FTL, FTQ, FTR, FTZ, FT6, D29
888	Item maintenance	DZB
940	Warehouse shipping order	A2_, A4_, A5_, AC6-7, ACJ, AF6, AFJ, AFX, AFZ, AK6, AKJ, ARH, P12, P13, P18, P1B, P1C, P1H
945	Warehouse shipping advice	ARB
947	Warehouse inventory adjustment advice	D8_, D9_, DAC-D, DAS, DZK, P42, P9C, P9D

DoD Manuals and Federal Implementation Conventions

The establishment of the DLMS transaction sets within the ASC X12 standards represented merely the first step of the MODELS development effort. To ensure effective use of the new transaction sets, the DLMSO completed the following actions:

- Revised the DLSS manuals into a single DLMS manual to reflect the new transactions and established policies for new data elements and revised procedures.[3]
- Developed ICs that describe the specific data elements and codes to convey DLMS data.[4] To ensure cooperation and consistency with the goals of FIPS 161-2, the ICs were submitted to the Logistics Functional Working Group for review before they were submitted to the Federal EDI Standards Management Coordinating Committee for approval as federal ICs.

[3] U.S. Department of Defense, *Defense Logistics Management System*, DoD 4000.25-M, December 1995.

[4] The ASC X12 transaction sets are very generic. An IC is a document used by a trading community to define data elements and their formats. The federal government has specific procedures for establishing ICs for a transaction set to promote a single face to industry.

- Developed the means to administer the new system to accept future changes. This step includes, in conjunction with the participants reviewing and approving proposed changes, obtaining ASC X12 approval of changes and documenting the changes.

With these steps, DLMS was ready to be implemented. DLMS implementation was initially planned for incorporation into all the corporate information management systems developed by the JLSC. However, most systems were not deployed, and this change has delayed DLMS implementation that now needs to be incorporated into the legacy systems.

Appendix B
Technical Issues

DLMS Processing Principles

The DLMS brings new capabilities for exchanging and accessing interservice data. The capabilities provide an opportunity to revise fundamental principles and assumptions about the data sent and received by computers. The following basic principles should guide the DLMS processing actions:

- *Edit at origin.* To ensure the protection of the receiving application software, recipients will edit and, if necessary, reject and return transactions to the sender. However, processing delays will be eliminated and money saved if no erroneous transactions are received. Originating sites should edit and validate their transactions before sending them. Extensive editing and checking should be designed into new application interface programs that generate DLMS transactions. The edits should ensure that outbound data comply with DLMS rules and the requirements of the DoD components.

- *Eliminate unnecessary data.* Currently, the DLSS operate on a whole transaction basis. Additional transactions repeat a large amount of the original transaction data. In reality, only significant data need be transmitted. The DLMS should transmit only data not already available at the receiving computer. For example, under DLSS procedures, if a transmitted requisition is to be canceled, the cancellation transaction includes the entire original requisition and a cancel code. A significant amount of the original data, such as the original priority or advice data, is not necessary in the cancellation transaction and will not be included in DLMS exchanges. This principle should also be applied to images. All recipients do not require all data, and images should be tailored to meet the requirements of specific users. The tailoring of images may require modification of both application and application interface software.

- *Use data only as defined.* The space of DLSS transactions is limited. As a result, the DoD components use record positions assigned for interservice data for internal uses. DLMS EDI transactions will not have space constraints and will be able to support unique data. The DoD components are encouraged to use those capabilities, but need to submit their planned usage to DLMSO. All data elements should carry *only* the data defined in the DLMS implementation conventions.

PROCESSING ISSUES

ASC X12 EDI transaction sets, including those used by the DLMS, offer technical capabilities not available in the DLSS. These capabilities include providing several stock number transactions in an X12 transaction set and an extensive capability for acknowledgment and error reporting. The DLMS stakeholders need to determine to what extent the DLMS will use these capabilities. The following subsections identify three major categories of processing issues—transaction set content, routing, and processing; transaction set tracking and control; and error processing—and offer several recommendations.

Transaction Set Content, Routing, and Processing

Several content, routing, and processing issues are related to the groups of transactions and transaction sets, envelope identification control, and transaction set size.

GROUPS OF TRANSACTIONS AND TRANSACTION SETS

X12 transaction sets can carry several subordinate transactions (e.g., multiline requisitions). The subordinate transactions can be intended for different receiving activities.[1] Implementing these functions increases the complexity of the opening and routing activities of DAASC as well as the interface software at the initiating site.

Recommendation: Support a multitransaction capacity within a transaction set, but require all transactions to be addressed to the same recipient (other than DAASC).

Similarly, groups of similar transaction sets can be placed in EDI envelopes called *functional groups*. Several like or diverse functional groups can be placed in an outer EDI group called an *interchange set*. The issue of correct routing and multiple recipients applies to each level. All transaction sets in a functional group need to be the same type (e.g., requisitions), but each transaction set does not need to have the same destination. The DLMS working group needs to determine if all functional groups in an interchange set should have the same destination.

Recommendation: For the sake of operational simplicity, the following approaches are recommended:

- For transactions that DAASC is not required to open for immediate processing, DAASC will archive the entire interchange set and may open it later for inclusion in LIPS or another database. However, DAASC will not edit or alter the interchange set before forwarding it. The outer envelope

[1] For example, in multiline requisitions, one requisition can be intended for a DLA center and another for a Navy ICP.

and ISA segment of each interchange set should identify the ultimate recipient. All functional groups, transaction sets, and subordinate transactions should be addressed to the same recipient.

- For transactions that DAASC needs to open and edit or process, the ISA segment should identify DAASC. The functional groups in the interchange set may be addressed to different recipients. Each group start segment will identify the recipient, and all transaction sets and their subordinate transactions will be addressed to that recipient.

ENVELOPE IDENTIFICATION CONTROL

EDI interchange sets, functional groups, and transaction sets contain provisions for unique identification numbers. Clarification is needed on how they should be used and if any system should be used to standardize the identification.

Adding information (for example, requisition numbers consist of a DoD activity address code, Julian date, and serial number concatenated together) to a unique identification number increases the complexity of the process. However, beginning an identification number with a unique code for the originating organization and including a serial number for that organization would benefit DAASC archiving activities. The DLMS Technical Working Group will need to address this issue.

TRANSACTION SET SIZE

The ASC X12 transaction sets do not set practical limits on the size of a transaction and a transaction set. A transaction set can be generated with a size that exceeds the capacity of the receiving site or the telecommunications path:

- Maximum size of a single interchange set: one million characters (as previously recommended by the DLMS Technical Working Group)
- Maximum size of a single transaction set: to be evaluated by the DLMS Technical Working Group
- Maximum size of a single transaction: to be evaluated by the DLMS Technical Working Group.

Transaction Set Tracking and Control

Several tracking and control issues are related to the archiving and acknowledgment actions.

ARCHIVING

All outbound transmissions should be archived at the initiating site and be retrievable for retransmission in case telecommunications outages or other failures prevent the receiving site from obtaining the data. Inbound transactions should also be logged.

The DLMS technical and functional working groups should jointly determine the period to maintain archives of outbound transmissions (DAASC maintains all inbound and outbound archives for 10 years) and the procedures for requesting a retransmission.

ACKNOWLEDGMENTS

Many DLSS transactions, particularly in the requisition process, provide the recipient a capability to acknowledge receipt, provide functional status to the originator, and return rejected transactions. These capabilities have been incorporated in the corresponding DLMS transactions sets. However, EDI offers the opportunity for additional acknowledgments. As indicated by Part 10 of the *Federal Implementation Guidelines for EDI,* the following events can occur:

- DAASC (acting as an ECPN of DISA) returns a 242 transaction set to the point of outbound translation. If DAASC does not provide a positive response within 2 hours, the point of translation sends a 242 inquiry.
- When DAASC forwards a transaction to a VAN, DAASC receives a TA3 segment as an acknowledgment in a manner similar to the action of the 242 transaction set. DAASC also returns a TA3 to a VAN.[2]
- When DAASC forwards a transaction to another DoD site, DAASC receives a 997 transaction set that is forwarded to the originator.

The 997 transaction set is the key to the standard X12 acknowledgment model used by industry. The transaction set indicates that the receiving EDI translation software received the transaction. The 997 transaction set can perform syntax checks of the incoming envelope and its transaction sets and respond in the following ways:

- The 997 transaction set can acknowledge a positive acceptance of the transmission as a whole, acknowledge an acceptance with errors, or reject the entire transmission (usually only for errors in the envelope).
- The 997 transaction set can perform the same acknowledgment and rejection actions on a transaction-by-transaction basis.

[2] A VAN is a commercial organization that acts as a hub to store and forward EDI communications.

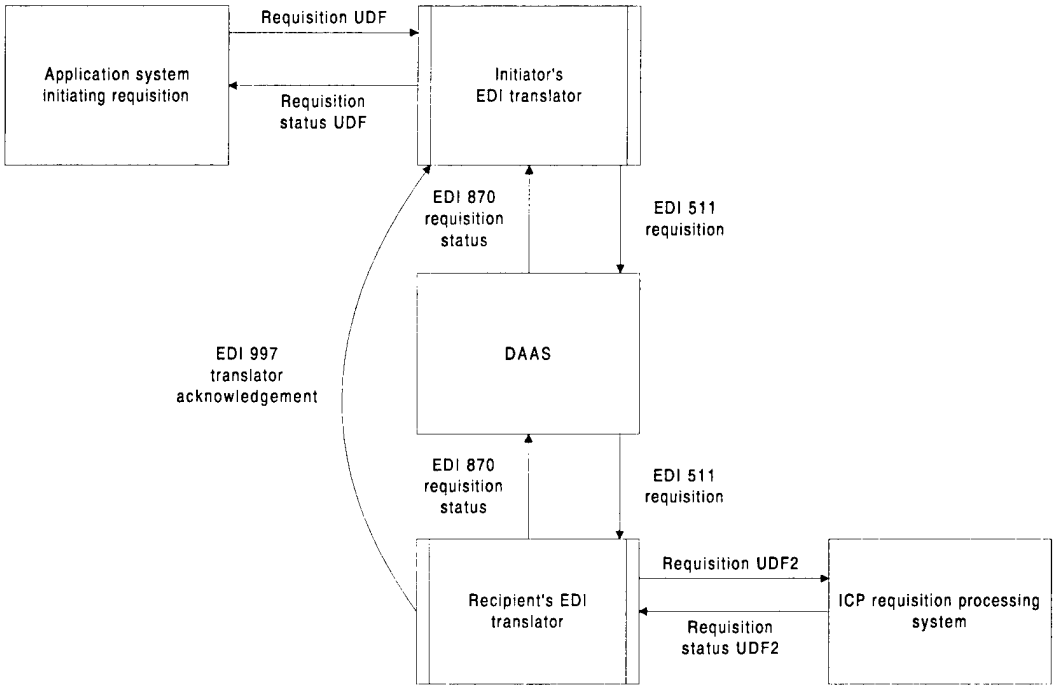
The use of the 997 transaction set raises several issues that the DLMS community needs to resolve. The number of DLMS transactions will be very large. The DLMS working group needs to determine if the higher level caused by acknowledgments is desirable (e.g., the critical requisition process already includes status capabilities). However, for DLMS transaction sets that do not have status responses, the 997 could be used (e.g., with DoD invoices). The 997 transaction set responses can also be tailored to acknowledge the receipt of an envelope and return transaction-level data only if an X12 syntax error is identified for a transaction set. This approach dramatically reduces the number of responses if several transaction sets are grouped in a message envelope.

In addition, the 997 transaction set processes errors only for the X12 data standards. For example, errors occur when a mandatory data element is not sent, a data element is too long, or a date is formatted incorrectly. However, a translator does not correlate those errors to the IC or functional data. For example, a translator does not identify an incorrect requisition format. The 997 transaction set also provides receipt only from the inbound translation software—*not* to the receiving application system. If the translator is collocated with the receiving application system, an assumption can be reasonably made that receipts were also received by the application system. However, if the translation software is regionally based (for example, DLA performs translation at Richmond, Virginia, for a non-DLMS application system in Utah) or the translation is performed by DAASC, an assumption cannot be made that the 997 transaction set is the equivalent of a receipt by the final application system.

Recommendation: The previous DLMS Functional Working Group decided not to use the 997 transaction set (except for finance transactions). The current group should review this decision and revalidate or revise it. We recommend that if the 997 transaction set is to be used, it be used only to acknowledge a message and provide notification of transactions containing errors. This review should be made for each transaction set and needs to consider other decisions related to transaction set groups and the use of the TA3 and 242. Figure B-1 is a simple view of one of the many approaches that can be used for acknowledgments. (The figure does not include the use by DAASC of an EDI translator that returns an acknowledgment.) The initiator sends a requisition that passes through DAAS to the recipient's EDI translator. This program generates a 997 functional acknowledgment. The receiving translator can be mapped to send a 997 to acknowledge only the group (of one or more requisitions), acknowledge each requisition, or acknowledge one or more requisitions with EDI syntax errors. After the translator processes the requisition, the UDF—labeled *UDF2* because it may not be the same format that the requisitioning system uses—is sent to the ICP requisition module. The system edits the requisition and determines the supply status. An 870 supply status is returned. In this example, DAASC is portrayed as the only middleman. In other circumstances, a contractor's requisition can flow through the contractor's VAN to a DISA ECPN to be sent through DAAS to the receiving ICP. The X12 standards

include an acknowledgment that is exchanged between the two middlemen to archive transaction routing and timing.

Figure B-1. One Approach for Acknowledgments



Error Processing

One function of the interface program is to validate the data to ensure they do not damage the receiving application. A key question is how much error checking the program should do. If all participants carefully edit their transactions when they are created, *bad* data should not occur. However, maintainers of receiving software will not want to risk the consequences of receiving bad data. Even after 30 years of operating with the DLSS, DAASC still rejects nearly 1 percent of all incoming transactions. The implementation testing of DLMS will initially produce a significantly higher number of rejections.

When translators, application interface programs, or application software detect an error, a means is needed to communicate the error to the recipient. For ASC X12 syntax errors discovered by the translator, the typical means is to return a 997 functional acknowledgment transaction set. However, business errors are communicated by other means.[3] One alternative is for the receiving application program to respond to the originator with an 824 application advice transaction set with error codes. The DLMS trading partners need to agree on this transaction set or other reporting means.

[3] Business errors include submitting requisitions for a quantity of zero, excess quantities, or an item that the requisitioner is not authorized to acquire.

The DLMS architecture anticipates that DLMS commercial participants will be connected to DAASC through a commercial VAN (although they may also be connected to a megacenter and DAASC for non-DLMS EDI). Commercial organizations exchanging EDI transactions (DLMS or others) with DoD have to register with DISA and use a DISA-approved VAN. For example, a DoD requisition issued by a commercial vendor is translated to a DLMS EDI format by the organization and sent to the following activities:

- Vendor's VAN
- DAASC
- Receiving DoD activity.

UNIQUE DATA

In actuality, the issue of unique data is simply another processing issue; however, this topic is so important an issue that we address it separately. The DoD components have the following two types of unique data:

- Unique data elements carried in the DLSS transactions
- Unique data elements transmitted outside the DLSS as unique transactions.

The first type is relatively simple to address. All DLMS transaction sets have data elements that can carry unique data elements. The DoD components can provide DLMSO with the data elements by DLMS transactions and associated data formats and code lists so the data elements can be documented in the ICs and related DLMS documentation.

The second set represents a more substantial challenge. Although no review has been conducted to provide the rationale for these types of unique data elements, anecdotal evidence supports the view that DoD components need to transmit data that the DLSS does not support. As a result, the DoD components developed their own transactions as they modernized their logistics programs. Many transactions are DLSS-like and are documented in manuals of the DoD components. However, many variable-length transactions that have been developed recently are not well-documented. The amount of these transactions and the number of transaction types may well exceed those of DLSS transactions. These variable-length transactions can be segregated into the following three categories:

- Transactions that contain significant data that can be added to a DLMS transaction set

- Transactions (e.g., maintenance) that are not reflected in the DLMS and are similar to transactions used by another DoD component[4]
- Transactions that can be converted to X12 transaction sets consistent in style with the DLMS, but maintained by a DoD component.

CONFIGURATION CONTROL

Changes to any standard system used by a large community need to be limited to prevent increased system maintenance costs; however, the system needs to evolve to meet new requirements and support new technical innovations. This issue was certainly prevalent in the DLSS environment. However, implementing a major DLSS change for all systems of the DoD components frequently took 7 years. This lengthy implementation period is one rationale for establishing the DLMS. Using ASC X12 standards for the DLMS requires that configuration control of both the DLMS release and the ASC X12 standards be maintained.

DLMS CONFIGURATION CONTROL

All transaction sets will comply with the implementation conventions defined in the DLMS manual for transmissions within and among DLMS participants. When DoD components require a modification of the DLMS implementation conventions to meet new data requirements, they should submit a request to the DLMS Process Review Committee using procedures defined in the DLMS manual. If the change requires a modification to the underlying ASC X12 standards, DLMSO will work with the Federal EDI Standards Maintenance Coordinating Committee to submit the change to X12.

ASC X12 CONFIGURATION CONTROL

All DLMS trading partners need to use the same version and release of the DLMS, and their EDI translators need to use the same version and release of ASC X12 standards. Although the ASC X12 standards are updated only annually, translation software is required to support the last four ASC X12 versions and releases. Therefore, if revisions to the X12 standards do not affect the DLMS, DLMS EDI translators need to be updated to reflect the most current ASC X12 standards only once every 4 years. However, updates will probably be necessary more frequently to reflect changes in the X12 standards that affect the DLMS.

[4] These unique transactions can be combined into a single standard transaction set.

Appendix C
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Appendix D
Abbreviations

ADP	automated data processing
ANSI	American National Standards Institute
ASC	Accredited Standards Committee
AUTODIN	Automatic Digital Network
C4ISR	command, control, communications, computers, intelligence, surveillance, and reconnaissance
CAGE	commercial and government entity
CAV	Commercial Asset Visibility
CDA	central design agency
COE	common operating environment
CONUS	continental United States
COTS	commercial off-the-shelf
DAAS	Defense Automatic Addressing System
DAASC	Defense Automatic Addressing System Center
DFAS	Defense Finance and Accounting Service
DII	Defense Information Infrastructure
DISA	Defense Information Systems Agency
DISN	Defense Information System Network
DLA	Defense Logistics Agency
DLIS	Defense Logistics Information Service
DLMS	Defense Logistics Management System

DLMSO	Defense Logistics Management Standards Office
DLSS	Defense Logistics Standard Systems
DoD	Department of Defense
DoDAAC	Department of Defense Activity Address Code
DoDAAD	Department of Defense Activity Address Directory
DRMS	Defense Reutilization and Marketing Service
DUNS	data universal numbering system
DUSD(L)	Deputy Under Secretary of Defense (Logistics)
DVD	direct vendor delivery
EC	electronic commerce
ECPN	electronic commerce processing node
EDI	electronic data interchange
FEDSTRIP	Federal Standard Requisition and Issue Procedures
FIPS	Federal Information Processing Standard
GBL	government bill of lading
GCSS	Global Combat Support System
GDMS	Global Database Management System
GSA	General Services Administration
IC	implementation convention
ICP	inventory control point
ILCS	International Logistics Communications System
ITV	in-transit visibility
JCS	Joint Chiefs of Staff
JECPO	Joint Electronic Commerce Program Office

JLSC	Joint Logistics Systems Center
JTA	Joint Technical Architecture
LAN	local area network
LIPS	Logistics Information Processing System
LITA	Logistics Infrastructure Technical Architecture
LOGDESMAP	Logistics Data Element Standardization and Management Program
MAPAD	Military Assistance Program Address Directory
MILS	military standard
MILSBILLS	Military Standard Billing System
MILSCAP	Military Standard Contract Administration Procedures
MILSPETS	Military Standard Petroleum System
MILSTAMP	Military Standard Transportation and Movement Procedures
MILSTEP	Military Standard Supply and Transportation Evaluation Procedures
MILSTRAP	Military Standard Transaction Reporting and Accounting Procedures
MILSTRIP	Military Standard Requisitioning and Issue Procedures
MODELS	Modernization of the Defense Logistics Standard Systems
NIMA	National Imagery and Mapping Agency
NIPRNET	Nonsecure Internet Protocol Router Network
NSN	national stock number
OSD	Office of the Secretary of Defense
PQDR	product quality deficiency report
PRC	process review committee
ROD	report of discrepancy
SDR	supply discrepancy report

TAV	total asset visibility
TCN	transportation control number
TDR	transportation discrepancy report
TRC	Technical Review Committee
UDF	user defined file
VAN	value-added network
WAN	wide area network
WFN	wide frequency network
Y2K	year 2000